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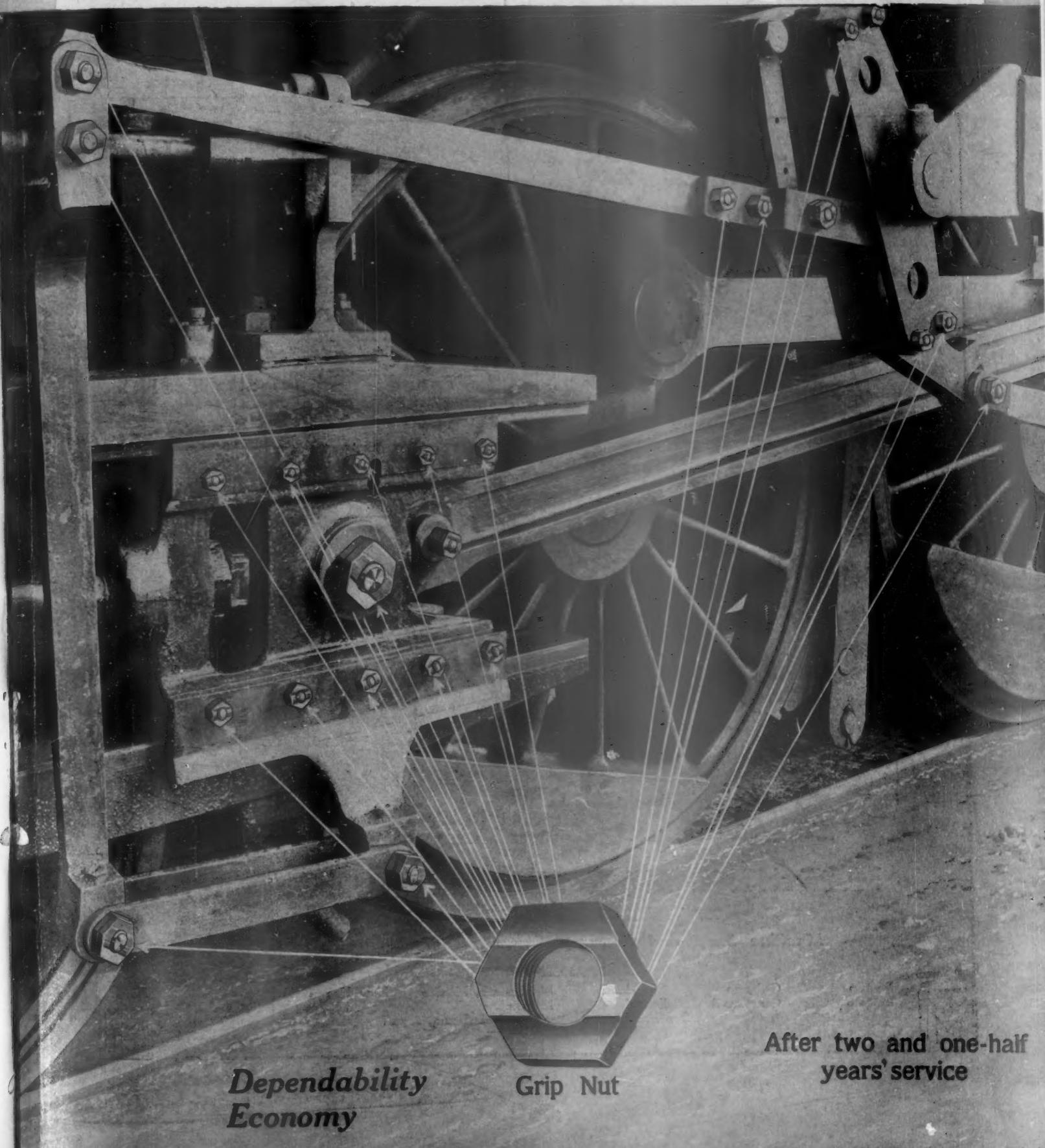
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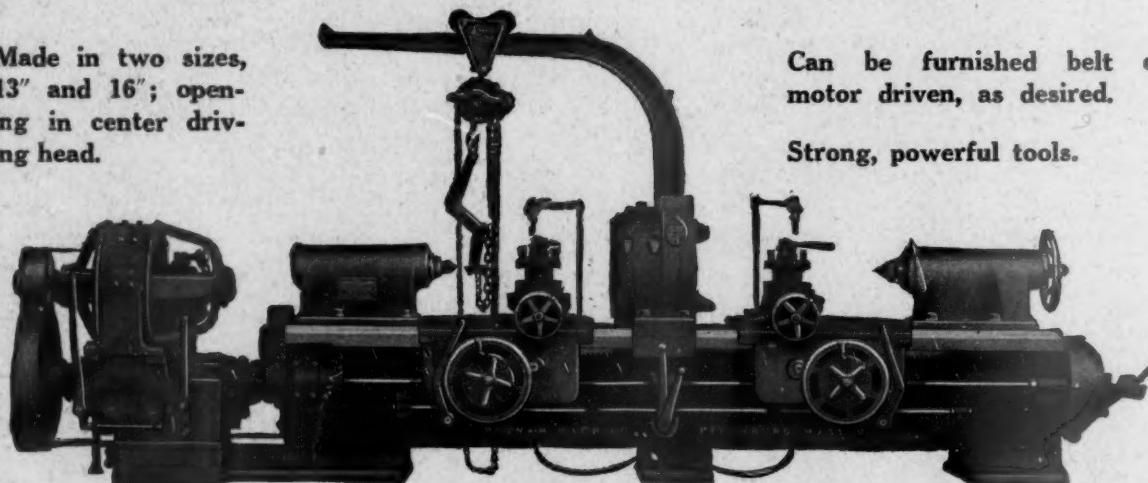
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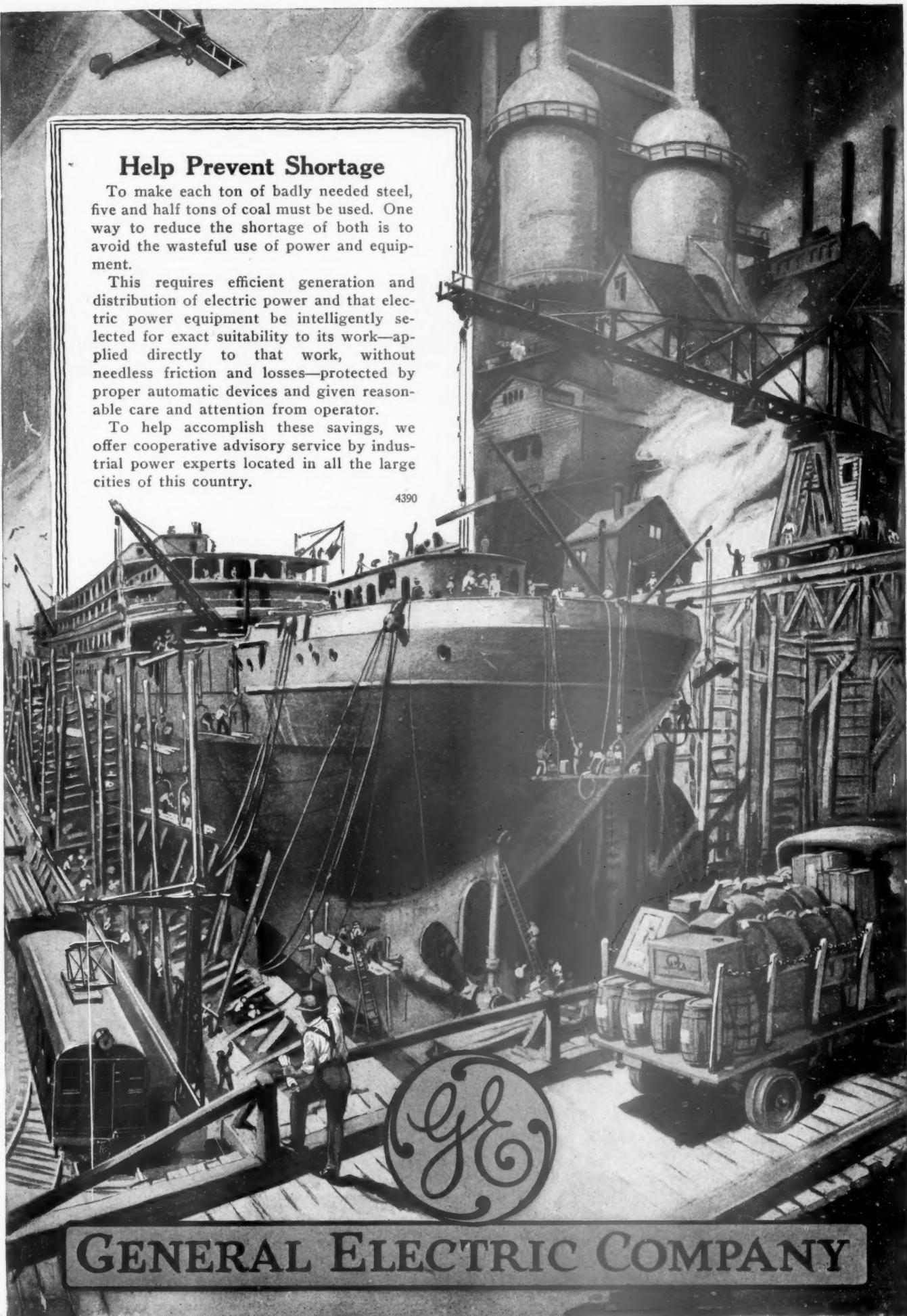
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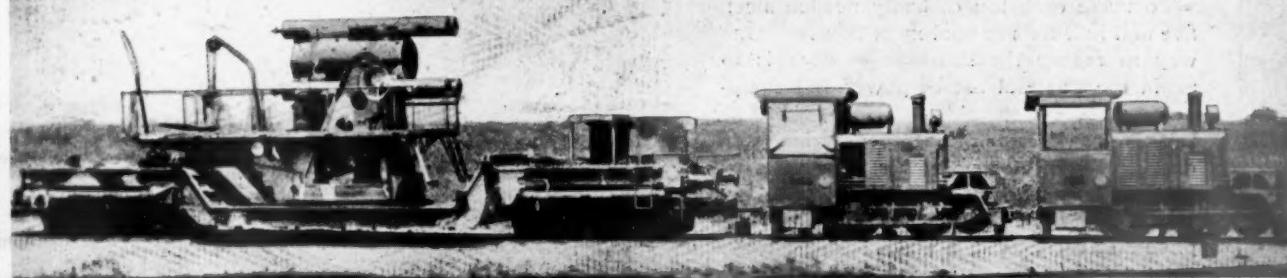


GENERAL ELECTRIC COMPANY



Railway Age

Vol. 65 December 27, 1918 No. 26



One of the Guns Recently Demonstrated at Aberdeen, Md.

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EDITORIAL

Railway Age

Important for Subscribers

In the interest of the conservation of paper, the Railway Age will print at the end of the present volume only a sufficient number of indexes to meet direct requests from its subscribers. Those desiring indexes should, therefore, immediately advise the New York office, 2201 Woolworth Building, New York.

Special tribute was paid at the December meeting of the New York Railroad Club to the railroad men in the American

Railway Men in the A. E. F. Expeditionary Forces in addresses by Colonel H. C. Booz, corporate engineer of the Pennsylvania Railroad, who until recently was on the staff of Brigadier-General W. W. Atterbury in

France, and by Lieutenant-Commander Dexter C. Buell, who had charge of the construction and erection of the naval railway batteries which were described in the *Railway Age* of November 29, page 967. Working in strange surroundings and with inadequate facilities, no task seemed too great for these men. They exercised to the full that ingenuity which is so characteristic of the Yankee and never lost their sense of humor, which often helped them to approach their tasks in a spirit that overcame seemingly insurmountable obstacles. As Lieutenant-Commander Buell said, we ought to give these boys a royal welcome when they return to this country. Moreover, their experience should fit them for bigger and better positions than those that they left to go into service. No better appreciation can be shown to them than by making the very best use of their services when they return to their respective roads.

Railroad men in military service are commencing to return to civilian life, many of them with the expectation of resuming their peace-time occupations. Several incidents which have come to our

Re-employing Returned Soldiers attention would seem to indicate that some of them are experiencing difficulty in getting back their old jobs.

Either for fear of seriously disturbing the existing organization or because of lack of interest, some railroad officers are putting off these men with promises, or are referring them to other departments or railways. It is the opinion of the *Railway Age* that the Railroad Administration and the officers in charge of the individual lines should outline a definite policy to be observed in connection with the re-employment of men who have been in the nation's service which will insure them just treatment. It is not necessary for old employees to give up their seniority rights to make room for returned soldiers, but certainly it is not unfair for those who took the places of army men to give way. Those who answered our country's call have made their sacrifice; now let those who replaced them make theirs. It is true that the reassimilation of thousands of employees will tend to disorganize the railways for a time, but surely to no greater extent than was effected by the loss of these men during the war when labor was scarce and a disturbance of our trans-

portation machinery much more serious in its consequences. There is no dodging the issue—the men who served their country in its time of need must be given what is properly due them.

At a recent meeting of one of the railroad clubs at which the subject of fuel conservation was being discussed, a question was raised as to what arguments should

Why We Should Continue to Save Coal

be put forth to exhort the men to continue to save coal now that the war is practically over. During the war there was no question but that every pound of fuel should be made to perform the greatest amount of work, as it contributed directly towards the winning of the war; but now, with that tremendous incentive removed, how shall the men be encouraged to persist in their fuel economies? There are three important reasons. We must still provide our allies with coal; we must conserve coal on account of its still excessive cost; and we must conserve coal in order to husband our national resources. The price of coal is that which appeals more directly to the individual. This has increased greatly and today railroads are paying anywhere from 10 to 50 per cent more per ton of coal than last year at this time. Some roads are paying over eight dollars a ton for fuel, several over four dollars, and a large number over three dollars. The large amount of money spent for fuel and the splendid opportunities for conserving it make the saving of fuel a ready means for reducing operating expenses. The savings to be accomplished are large enough to warrant material capital expenditures which will result in a reduction in the fuel bill. It is no time now to ease up on the fuel economy campaign. With the high cost of labor and materials, all tending to increase the operating expenses, every available means must be taken to reduce expenses. Anything that will result in fuel conservation should continue to demand the fullest consideration of railway men.

The advocates of government ownership hold up government operation of the railroads during the past year as having effected the elimination of many abuses or shortcomings of private management.

"This Place Has Changed Hands"

They neglect, however, to note those objectionable features of private ownership which are aggravated or intensified by operation of the railroads as a unified whole. For instance, it is an unfortunate fact that changes of management or the election of a new railroad president commonly result in an extensive change of the official personnel, bringing about an objectionable shaking up of the entire organization. Whether such changes are necessary or desirable may be open to controversy, but the fact remains that, other things being equal, the best esprit de corps and most efficient conduct of railway transportation obtain in the case of the road on which one dynasty of officers has had unhampered control for the longest period. That a change of management under government operation is subject to the same abuses as those manifested under similar circumstances in private control is evidenced by contemporaneous history. Following the resignation of the director general two of his department heads

have resigned and there are rumors of still more resignations, and there is no reason to believe that similar changes will not take place every time that a director general decides to quit.

Postal conditions in this country have been bad enough, but the difficulties in obtaining mail from abroad have been much greater. We almost despaired

Great Britain's Railway Problem

of hearing from our editor, Samuel O. Dunn, until he returned in person, but were finally rewarded by receiving from him a few days ago the first one of two articles on the English railway situation. There is more or less discussion in Great Britain as to the advisability of having the government take over the railways permanently, but for very different reasons than those that have been advanced by the advocates of government ownership in this country. The railways of Great Britain have made a record during the war which they can well be proud of and which is undoubtedly better than that of the railways of any other country. They were taken over by the government at the outbreak of the war, but their operation was left in the hands of skilled railway executives, the government guaranteeing financial returns on the basis of the year just preceding the war, 1913. Government freight has been carried free and no accurate record has been kept of it. Meanwhile, as in this country, wages have been raised and operating costs have gone up by leaps and bounds. Now that the time is approaching when the roads must soon be returned to their owners, the question comes as to how they can keep out of bankruptcy. There promises to be a strong fight against raising rates, which have remained stationary throughout the war, and yet the roads cannot possibly pay the high wages and other costs which are still on a war basis unless the rates are raised. As an alternative it has been proposed that the government take over the roads, which means that the rates, in effect, would have to be raised because the public would have to meet any deficit by taxation. The two articles by Mr. Dunn outline the situation clearly and compare it with conditions as they have existed and now exist on the roads of the United States.

As will be noted elsewhere in this issue, it has been decided to hold the annual conventions of the Master Mechanics' and

The June Mechanical Conventions

Master Car Builders' Associations, including the railway supply exhibit, at Atlantic City next June. Frank McManamy, in charge of the mechanical department, Division of Operation of the Railroad Administration, was present at the joint meeting of the executive committees and advised with them and approved of their decision to hold the conventions and the exhibit. The two mechanical associations have a remarkable opportunity before them if they will but take advantage of it. While it is of course necessary to conduct a certain amount of routine business and receive the reports of certain standing committees, a large part of the program of both associations ought to be devoted to the larger problems which face the mechanical department, whether the roads are still operating under government control next June or are in the hands of their owners. The executive committees of both associations will do well if they immediately assign to special committees the matter of preparing and presenting certain special reports of this sort. The railway supply companies have not had an opportunity of making an exhibit for three years. The railroad men were insistent that there be an exhibit, because of the developments which have taken place since the last exhibit and because of the great educational value of

the exhibits. Exhibitors should therefore study carefully to prepare and arrange their exhibits in order to make them of the greatest possible educational value to the railroad men, and particularly to those who attend the conventions for the first time or who are specially delegated to make studies and reports of devices and equipment that may be used to advantage on their respective roads. Then, too, the railroad men should co-operate with the railway supply men in encouraging as large an attendance as possible of railroad men from foreign countries. The railroads throughout the world are short of equipment and supplies and many of them are looking to this country to help them out. Where could they find a better opportunity of looking into the possibilities for improving their equipment and of starting negotiations for its purchase than at Atlantic City next June?

An Extra Session of Congress

WITHOUT CONGRESSIONAL ACTION, the director general of railroads and the President can do little, if anything, of a constructive nature in the present railroad situation. Mr. McAdoo betrays signs of rather bitter resentment that he was not able to stampede the expiring Democratic Congress into giving the country public ownership of railroads through the device of extending for five years government control and operation. The difficulties of the Railroad Administration's situation should not be minimized; they are very real and very pressing. A great part of the brilliant pleading of Walker D. Hines as representative of the director general before the railway committee of the United States Chamber of Commerce, is incontrovertible. The net earnings of the roads in recent months are discussed elsewhere, but the difficulties of the distribution of standard equipment and the allocation of its cost to individual corporations are well illustrated in the suit which the receiver of the Toledo, St. Louis & Western has brought. The revolving fund of \$500,000,000 has quite evidently proved inadequate. Much of what Mr. McAdoo and Mr. Hines say about the morale of railroad officers and employees has truth in it. The arguments which Mr. Hines uses in his plea for Mr. McAdoo's five-year proposal are in major part arguments for a prompt settlement of the railroad question.

Prompt settlement does not mean a blind acceptance of one or other horn of a dilemma. Congress must carefully study the railroad situation. This careful study can be made promptly either by calling an extra session of Congress, say, early sometime in April, or by the appointment of another committee to succeed to the duties of the Newland's Committee. There would be certain advantages in the appointment of a committee rather than the calling of an extra session of Congress, the chief of which would be the evidence of the politics which would begin to be played as soon as a Republican Congress was convened. The logical man for chairman of such a committee, if it were to be appointed, would be Senator Cummins, of Iowa.

The danger in appointing the committee to carry on the investigation of the railroad subject, began by the Newlands Committee, would be that the discussion in Congress itself would be postponed until December, 1919, when the regular session would be called, which would bring this discussion on in the midst of a presidential campaign and would project too far into the future a definite action of Congress toward passing the laws necessary to a constructive policy of regulation and operation and financing of the railroads. If it is possible to bring it about, there ought to be an extra session of Congress early next Spring.

President Wilson, when he called an extra session of Congress in 1913 and put through the Federal Reserve Act, demonstrated how quickly and how satisfactorily a great and

complicated question can be handled if the proper leadership is applied. It is not safe, however, to assume that President Wilson will call an extra session of Congress without a clear mandate from a large and influential and representative "voice of the people." Most directly affected by the railroad situation are the railroad executives, the representatives of the railroad securities holders and the railway supply industry. It is only, however, in directness of contact with the problem that these classes of citizens have one whit more at stake than has every business man in the country.

The railway executives, through their standing committee of 28, with its sub-committee of 5, have formulated a tentative plan which, if it meets with approval by the members, may be presented to Congress as a suggestion for the basis on which Congress can work. It aims only to clear up certain preliminary difficulties. The object which the executives must have kept in view is the immediate necessity of making it possible for the roads to be returned to their owners for private operation on a foundation of sound economic laws regulating the railroads.

The organization known as the National Association of Owners of Railroad Securities has, since its formation, been studying the railroad situation and has voiced the opinion of certain representatives of institutions deeply interested financially in railroad securities. Since the President's departure for Europe and his tossing of the railroad problem into the lap of Congress, and since Mr. McAdoo's modification of the toss by demanding and asserting that the problem had a steel cable attached to it in the form of his five-year demand, the National Association of Owners of Railroad Securities has made no public expression of opinion. Its help is needed and needed badly. An expression of opinion by S. Davies Warfield, and the association of which he is president, would be welcomed by Congress and by the public generally, and unquestionably by the railway executives as well.

The Chamber of Commerce of the United States is an impressive body; the result of one of its referendums is impressive. It reflects the judgment of business men over a wide range of country and of industry; it is necessarily cumbersome. The process of getting an expression of opinion is long drawn out and while this adds something to the impressiveness of the result obtained, it detracts greatly from the value of the work of the chamber in a crisis such as the present one. The board of directors of the chamber formulates resolutions which it presents to the national council of the chamber, which in turn may adopt resolutions which come before the annual meeting of the chamber, which in turn adopts resolutions. The board of directors may authorize the submission of a report of a carefully selected committee which is appointed to analyze each question presented to it by members of a referendum of members, and only the vote of the member organizations can commit the Chamber of Commerce for or against any recommendation.

The chamber will doubtless send a referendum out to its members on the question of the advisability of calling an extra session of Congress to discuss the railroad situation. If such action is taken, the question asked the members should be in the simplest form. The chamber held a referendum in 1917 on the labor question, with the object of having an expression of opinion from business men as to whether or not the four brotherhoods of train and enginemen should be compelled to submit their demands to arbitration. The referendum, however, was so complicated as to fail to obtain concrete results. What was needed then was a simple, brief statement which would inform President Wilson of exactly where the business men of the country stood in regard to the hold-up by the railroad brotherhoods. What is wanted now is a simple statement showing that the business men of the country are overwhelmingly in favor of calling an extra session of Congress. It will be some weeks, possibly months,

before the result of a referendum, if now inaugurated, can be put into final shape for presentation to Congress or to the President.

In the present situation, immediate action is of the utmost importance. On an important occasion in the past, the chamber has departed in practice, although not in theory, from its rule and has presented to the government expressions of opinion of its members without waiting for the formalities attendant upon a referendum. In the present case, might it not be a typically American, businesslike and enterprising thing to do for business firms all over the country to write or to telegraph the chamber a full expression of their views on the railroad situation, and especially upon the necessity of calling an extra session of Congress? Were every member of the chamber to give expression to its views without waiting for the slow grind of the referendum, the president of the chamber would have available a mass of evidence which he might present to President Wilson on his return from Europe that would constitute a "voice of the people" unmistakable and compelling.

The Railway Business Association has sent out a questionnaire to its members which is brief enough to print in full elsewhere in this issue. It is admirable in the directness of the questions asked, and the replies to these questions constitute an expression of expert opinion which should carry great weight.

Now is the time to act; action now will be constructive; failure to act and argument and disagreement now will be mere wrangling. Argument has its proper place before the extra session of Congress which ought to be called. Prompt action now, however, is the only method of securing this extra session of Congress.

Can Rates Be Reduced?

RESTRICTIVE LAWS against pooling of facilities was only one of the reasons why it was considered necessary for the government to take over the railroads last December. The financial situation was equally a menace unless the government took some steps to stabilize the credit of the individual railroad corporations. The expedient adopted of guaranteeing a rental equal to the average operating income of each road during the past three years was, of course, a temporary measure only. Railroad stock prices immediately responded by rising on an average for 50 roads of over 7 points, but the average high point for these 50 roads reached in this rise was approximately 60 or 40 points below par and during the year the average prices of these stocks have fluctuated around 60, rising only once, and that in November, above 70; they are now in the neighborhood of 64.

Last Friday the Pennsylvania sold \$50,000,000 of bonds through Kuhn, Loeb & Co. The sale was a great success and the issue was heavily oversubscribed; but even the Pennsylvania could not have sold stock at par. Of the 44 companies having stock listed on the New York Stock Exchange and actively traded in, only 8, namely, the Atlantic Coast Line, Delaware & Hudson, Delaware, Lackawanna & Western, Lehigh Valley, Louisville & Nashville, Norfolk & Western, Reading, and the Union Pacific, have common stock selling at above par. In most states it is unlawful for a corporation to issue its stock at below par. It would be necessary, therefore, for nearly all of the railroad companies of the country to raise new money through the issue and sale of bonds. Most roads have a greater proportion of their capital outstanding in the form of bonds than in the form of stock even now, and to increase the proportion of bonds would be a thoroughly unsound proceeding.

Only a comparatively few roads are going to earn sufficient net in the calendar year, 1918, to meet the government's

guarantee of rental. In other words, most roads will not do as well, so far as net earnings are concerned, in a year of abnormally heavy traffic and with freight and passenger rates for part of the year from 25 to 50 per cent higher than they were in previous years, as they did on an average for the three years prior to June 30, 1917. It is true that the increased rates were effective for only part of the year, while the large increases in rates of wages which have been made under government operation were, most of them, retroactive, so that wage increases extended for a good part or all of the year. Even in the month of October, some roads were charging into the expenses of that month a part of the back wages due on these retroactive awards. It is true that operation under war conditions is not a fair test of the earning power of the roads, but in October war conditions had ceased to exist in so far as hampering railroad operation was concerned, and there was a large amount of government business moving which made gross earnings higher than they would have been otherwise. It is pretty safe to say that for the majority of roads the amount charged in October to expenses for retroactive wage awards was not great enough seriously to effect an assumption of a rough figure based on October net earnings, because there was a heavier freight movement and, therefore, greater gross earnings in October, 1918, than would be likely on an average for the next twelve months.

Mr. McAdoo in urging his plan for the retention of the roads for five years instead of 21 months, makes the claim that he will be able to reduce freight rates within a comparatively short period of time. The October figures, even making full allowance for what back pay there is charged into expenses, do not bear out Mr. McAdoo's claim. It is conceivable, of course, that economies might be introduced into government operation which would tend to hold down expenses and correspondingly increase net operating income above the October figure, but the evidence of government operation in every other country in the world is against such an assumption and the government's management of the post office in this country is most decidedly against it.

Were the roads to be returned to the corporations for private operation, it is not only possible but probable that in time private initiative could get more effective work out of the officers and employees and that gross business could be increased by progressive management and operation without a corresponding increase in expenses, so bringing about somewhat better net operating income. On the other hand, were the roads to be returned to their owners without legislation protecting them from rate reductions by the Interstate Commerce Commission and state commissions, the danger of a reduction in net operating income through a compulsory reduction in rates would be imminent. The credit of the roads, with the exception of possibly a dozen, is such that widespread bankruptcy would be likely to follow a return of the roads to their owners without remedial legislation.

It is essential that if the government is to regulate freight and passenger rates with the prospect of preventing too high rates being charged the public, the government also must be responsible for seeing that high enough rates are charged to stabilize and maintain the credit of all of the well managed railroads which are necessary to the prosperity of the country. The law fixing this responsibility should above all things be definite. Congress should not attempt, by using some such word as "reasonable," to place the interpretation of the law and, therefore, its application, up to the Supreme Court. It should specifically state that earnings should be sufficient to pay a certain rate upon the amount of capitalization approved of by Congress.

Were such a law to be enacted and, furthermore, the law specifically to provide that the richer roads should absorb the poorer roads under some form of arbitration, subject to court review, the financial problem of the railroads would be in a fair way of solution.

Government Ownership in England

THE ENGLISH use of the word "nationalization" of railroads is synonymous with what we call government ownership. England is in the throes of a general election and in the campaign which is now being carried on the railroad problem occupies a prominent place. Since Mr. Dunn's article, published in this issue, was written, Lord Churchill has made a speech in which he apparently took the position that he stood for the nationalization of the English railways. Politics in England, as in this country, often leads to statements and claims in campaign speeches that are allowed to be forgotten just as soon as possible after the election takes place. While we have heard nothing directly from Mr. Dunn in regard to Lord Churchill's speech, from other sources it is learned that political exigencies of the moment may well have been responsible for this pronouncement in favor of nationalization. England and English economists and politicians have flirted with nationalization of railroads for a good many years. Sound students of railroad economics, like W. M. Acworth, have opposed the proposal vigorously and convincingly; but, nevertheless, it has raised its head again and again. In England, not only the post office, but the telegraph and telephone are under government ownership and operation. The telegraph system before the war was fairly efficient and the rates were low. The telephone system, however, was exceedingly bad when compared with our own. On the other hand, under private ownership and operation, the service on the railways was wonderfully good, although, of course, as Mr. Dunn points out, the rates were high. So far as it is possible to form any judgment at this distance, it would appear that Lord Churchill's utterances in regard to nationalization of railways did not voice the sentiment of any very large group of English public opinion and were for campaign purposes rather than the statement of a determined upon economic program.

New Books

Hydraulic Experiments. By Arthur M. Talbot, Fred B. Seely, Virgil R. Fleming and Melvin L. Enger. Bulletin 105, Engineering Experiment Station. Published by the University of Illinois, Urbana. Price, 35 cents.

The experiments reported in this bulletin cover the loss of hydraulic head in small valves; the flow of water through submerged orifices; fire streams from small hose and nozzles, and the orifice bucket for measuring water. The part covering small valves is of particular interest because of the interesting facts brought out concerning the relative efficiency of globe valves, angle valves and gate valves. The information on fire hose and nozzles, aside from its value from the designing standpoint, is of interest in fire protection studies.

Directory of the American Association of Engineers. 6 in. by 9 in. 192 pages, bound in paper. Published by the American Association of Engineers, 29 South La Salle Street, Chicago. Price, \$2.

This directory goes farther than the usual society year book in that the entry for each member includes a brief synopsis of his experience and training. In consequence a prospective employer or client is given some idea of the qualifications of the man under consideration for the particular purpose in hand. In addition to this roster of the members there is also a classified list subdividing the personnel under the different branches of engineering while indexing them for the character of position held. Some space in the book is also devoted to general information concerning the association; its purpose, growth, activities, etc.

Great Britain Faces Serious Railway Situation

Must Operate More Economically but Almost Insurmountable
Difficulties Are to Be Overcome

By Samuel O. Dunn
Editor of the *Railway Age*

LONDON, December 1, 1918.

THE PARTY OF trade paper journalists, of which I am a member, and whose members are here as guests of the British government, has now been in this country almost three weeks. It has been, for us, a fortnight of surprises, shocks and thrills. During the two weeks we were on the sea there occurred more great developments of vital importance to the human race than ever occurred before in an equal period in the history of mankind. When we sailed from New York on October 26 Turkey had not yet laid down her arms. We had no news from that time until we reached Liverpool on November 9. On our arrival there we learned of the great drive of the Italians, in which they took 500,000 Austrians; of the dramatic and overwhelming push of the Americans at Sedan, in which they retook the city whose capitulation to the Prussians almost fifty years ago made possible the creation of the German Empire of the Hohenzollerns; and of the uprisings in Germany and Austria which helped to precipitate the collapse of the autocratic governments of those countries.

Immediately on our arrival we were hurried down to London. Since arriving here we have heard of the signing of the armistice, which undoubtedly has ended the war, of the abdication of the Hohenzollerns and the Hapsburgs; we have been the recipients of the most generous hospitality from the British government and people; we have witnessed almost a week's celebration by the great population of London of the termination of the war in a manner which means so much to Britain, France, Italy, the United States, and, indeed, all the world, and we have seen the British grand fleet, and a large part of this tight little island.

Striking as all these things have been, nothing has impressed us more than the swiftness with which the British press, public men, business men and people have turned from the problems and tasks of war to those of peace. In fact, they began some time ago to consider broadly and deeply the problems of after-war work and created a Ministry of Reconstruction to formulate a programme. The end of the war came sooner than anybody expected, and therefore the progress which had been made with plans for reconstruction was comparatively small; but it was much greater, of course, than the advance which had been made along similar lines in the United States.

Britain's and America's Railway Problems

In the study of reconstruction, consideration of Great Britain's railway problem necessarily has an important part. The United States also has a great and vitally important railway question which the sudden ending of the war will make it necessary speedily to answer; and it is most interesting to survey the ways in which Britain's railway problem resembles ours, the ways in which it differs from ours, and the points of resemblance and contrast between the suggestions which are offered for the solution of the problems in the two countries.

Britain's problem resembles ours in the fact that its most important phase concerns the relations which shall be established in the future between the railways and the Government. It resembles it in the fact that under Government control large advances of wages have been made to railway employees which raise difficult questions regarding the pas-

senger and freight rates which should be charged in future. It is hardly an exaggeration to say that Britain's railway problem differs from ours in almost every other important particular.

It differs so greatly from ours because of the differences between the general conditions in the two countries; because of the widely different ways in which the railways of the two countries have been constructed, developed, operated, and regulated; because of the differences between the ways in which they have been handled during the war, and for numerous other important reasons. In spite of all these differences, however, the United States can learn something from British experience and opinion, and Britain can learn something from American experience and opinion.

Contrast of British and American Conditions

The railway mileage of the United Kingdom of Great Britain and Ireland is only about 25,000 miles. That of the United States is over ten times as great. And yet these doughty islands are so small, that their mileage is much larger in proportion to their area than is that of the United States. On the other hand our mileage is much greater in proportion to our population than is theirs. The British railways were built through settled communities primarily to serve a population and a commerce that already were here. Practically all the American railways were built to populate and develop the resources of new territories. The British were the pioneers of the world in railway construction and development, and pioneers are almost certain to make mistakes which those who come later will be able to avoid. Furthermore, the British railways, being built through settled communities, were originally constructed very strongly and expensively, with the idea of permanency, while ours, being built through unsettled territories, were, in the main, constructed lightly and cheaply, with the expectation that they would be largely or wholly rebuilt as the growth of traffic demanded it and the growth of earnings justified it. In consequence, it has been much easier for our railways than for the British railways to correct early mistakes of design and construction and to make improvements in track, structures, equipment and operating methods.

Finally, largely because this country was settled throughout already, the railways of the United Kingdom were early extended into all sections; while the extensive development of American railways had not become adequate to the country's needs when the restrictive hand of government was laid upon them and new construction was practically stopped. These and other conditions have contributed to making the railway problem of the United Kingdom what it is, and the railway problem of the United States the very different thing it is. In our country the cost of railway transportation had been reduced under private ownership and management before the war to the lowest point which had ever been reached in any country. While the British railways always have been privately owned and managed, they had not succeeded in getting the cost of transportation anywhere near as low as it has been reduced in the United States; indeed, it is much higher here than it is in most other countries, this being very largely due to the conditions—some of which have been mentioned—under which British

railways have been developed and operated. Consequently, in the United States, while it is still as necessary as ever to keep the cost of rendering the service of transportation as low as practicable, it is even more essential to adopt measures which will increase the capacity of our railways to handle business, and which will enable them to add to their mileage, and develop the resources of parts of the country which are now inadequately developed. On the other hand, in Great Britain, while there is need of additional mileage in some agricultural districts, the problem which most urgently demands solution is that of keeping down, or, if possible, reducing the cost of railway transport.

The average freight rate per ton per mile in the United States in 1917 was less than 7.2 mills, and even since the 25 per cent increase in freight rates made under Government control the average rate probably is not more than 9.4 mills. In Great Britain, although practically no ton mileage statistics ever have been kept, it was estimated that the average rate per ton per mile—for a much shorter average haul of course—was three times as high before the war as it was in the United States. Now, in Great Britain, as in the United States, large advances in wages have been made during the war. Before the war the British railways paid approximately \$250,000,000 of return upon their outstanding capital issues. The advances in wages which have been made since the Government took control of the railways in 1914 have been approximately equal to the total return which was paid upon railway capital then—and which is still paid, since the Government guarantees the before-the-war return. Now, while the British Government has increased the passenger rates 50 per cent, it has made no increase in the freight rates. It seems probable that if the railways of the United States should be returned to private management with both the present wages and the present passenger and freight rates in effect, most of them would be able to get along pretty well. On the other hand, while the railway statistics compiled in Great Britain—especially since the Government took control—are very incomplete, it is generally agreed that if the British railways should be returned to private control with the present wages and freight rates, and without any Government guarantees of net return, practically all of them would at once find themselves, in effect, bankrupt.

Why have not the freight rates been increased here, as they have been in the United States and many other countries since the Great War began? Partly because it has reasoned that since the British Government guaranteed the net return, there was no use, since if a deficit was incurred it would be paid in taxes by much the same people who would pay it in higher rates, if the rates were advanced. Probably more largely, however, because it was thought that the rates already were high, that an advance would impose an undue burden upon British commerce; and that any attempt to advance them would meet fierce opposition from the "traders"—or, as we call them, the shippers.

Now that the war is to all practical purposes ended, the question what shall be done with the British railways, their wages and their rates is receiving an increasing amount of attention. Some parts of the discussion move along lines parallel to those followed in the discussion of the railway question in the United States. Some parts of it follow lines which diverge widely from those along which the discussion in our country moves.

"American Methods" Advocated

The main thing for which British students of railway matters are seeking is means of reducing the cost of rendering transportation. In the course of this quest they are using many of the same terms which are being employed very freely in the United States, such as "unification" and "standardization." But the outstanding feature of the discussion—and of course it is a feature which arouses the pride of an

American who has been long somewhat intimately in touch with American railways—is the obvious effort which is being made to find means for applying "American methods" on British railways. By "American methods" I mean especially the methods which have been developed and employed in the United States and Canada to effect the handling of freight in large carloads and large trainloads. In the short time I have been in this country at least three official bodies have made public reports which they have prepared dealing with the railway problem of Great Britain from as many different points of view. The central thought of all of them, however, has been that means must be devised and adopted to enable British railways to handle traffic in larger units. No higher compliment could be paid to the genius with which the railways and the railway equipment and supply concerns of America have been managed, since we have led the world in devising and adopting machinery and methods for handling traffic in large units.

The investigations and discussions going on over here relate mainly to two phases of the railway problem. One of these is as to whether great changes shall be made in the railways physically, and, if so, what changes. The other is as to the extent to which unified operation shall be substituted for individualistic, competitive operation, and Government control for private control.

The Crux of the Physical Problem

The crux of the physical problem is presented by the so-called "structure gages"—what we, in the United States call lateral and overhead clearances—that is the distances from the track vertically to the tops of tunnels, etc., and laterally to structures along the right-of-way. Another important point is the strength of bridges. These and other points regarding the existing physical limitations of British railways were discussed by Sir John A. F. Aspinall, general manager of Lancashire & Yorkshire Railway, in his presidential address to the Institution of Civil Engineers on November 5 last. It is well-known that the average capacity of British freight cars is only about 10 or 12 tons, as compared with about 40 tons in the United States, and that British locomotives and cars, both freight and passenger, are much narrower than those of the United States, although the track gage is the same in the two countries. Sir John Aspinall said in part:

"The capacity of our rolling stock is hampered in an extraordinary degree by the fact that, as pioneers of railway construction, we could not appreciate what the immense growth of railway requirements would be, and what would be the dimensions of the loads we should be asked to carry, or the weight per wheel which our bridges would have to bear."

"The difficulties of altering the structure gages (clearances) are greatest with the small tunnels, . . . but we have many platforms which prevent the widening of any part of our rolling stock at a height of about 3 ft. 6 in. above the rails, while there are numerous girders standing up between the rails which are in the way, and there are many other points of obstruction. . . . On the British railways there are no fewer than 66 loading gages applicable to 150 sections of lines, all of which have to be taken into account when considering the forwarding of rolling stock. . . . There are in England, Scotland and Wales about 100 large and small separate railways with a 4 ft. 8½ in. gage, but the maximum number of railways which can accept loads of one of the largest, though not the largest, loading gages, is 18. Some of our railways have steadily improved their lines to get rid of these difficulties, but the wider and larger rolling stock, whether locomotives, carriages (passenger cars) or wagons (freight cars) which they can use, have to be confined to their own property. . . . The extreme dimensions of the cylinders of outside-cylinder locomotives have been reached on account of these obstructions, and render it difficult to design a more powerful locomotive constructed in this form. . . . Electric locomotives such as already have been designed can haul loads far beyond anything we handle in this

country, though their exterior dimensions at platform level would not foul our largest loading gages."

The ordinary overhead clearance on American railways is 16 ft., while on British railways it is but 13 ft. 6 in. Our ordinary lateral clearance is 10 ft. 6 in., while the maximum on most railways in this country is but 9 ft., although some, such as the Great Western, have a maximum of 10 ft. Unfortunately, however, a railway such as the Great Western, which has provided cars large in proportion to its clearances, cannot send them off its own rails. The difference between the situation in the great area of the United States and Canada, with their 300,000 miles of railway and in this "tight" little island, with its small mileage, may be strikingly illustrated by the statement of two facts. Practically any freight car belonging to any railway in the United States or Canada may be sent anywhere upon any line in either of those countries. On the other hand, in this country it was arranged during the war to send British coal in railway cars to a port on the English channel; take the cars across the channel in a train ferry to France; and then run the loaded cars upon the French railways to destination. It would have been desirable, of course, to have handled this coal in the largest cars available. But the Southeastern & Chatham, the railway over which it was necessary to move the coal in England, has the narrowest among structure gages in England, and could not accommodate the larger French cars, or even the largest cars of the British railways. In consequence, it was necessary to use in this service the smallest cars available, instead of the largest cars.

Difficulties of Increasing Structure Gage

It is becoming recognized by students of railway transportation in Great Britain that the structure gages of the railways should be increased and made uniform to enable them to use larger cars and more powerful locomotives and to haul heavier trainloads. The cost of increasing the structure gages of all, or even most, of the lines, would be extremely large. However, as Sir John A. F. Aspinall pointed out, it would cost no more than a few days of war; and once it was done the saving in operating expenses it would make possible would be enormous.

Even though the railways themselves increase their structure gages, however, the problem of realizing the economies this would render possible will still be far from solution. Freight cars move in and out of innumerable collieries, and manufactories, the structure gages within which also are restricted. How are the owners of these concerns to be induced to so reconstruct their works as to enable larger cars to move in and out of them?

Again, in 1913, the railways of Great Britain owned 790,000 freight cars, while in addition they had upon their lines about 700,000 cars which were owned by shippers. The shippers have in this country a "vested right," enforceable at law, to have cars owned by them used in handling their commodities. Many of these private cars are small; and even if the railways should increase their structure gages and enlarge their own equipment, the shippers ("traders") could largely defeat the efforts to effect economies by standing upon their vested right to have their commodities handled in their own cars.

Finally, it always has been the custom in this country for the shippers to send their commodities, and the railways to handle them, in very small consignments. How are they to be induced to ship in wholesale instead of in retail quantities? Sir John Aspinall suggests the adoption of the continental European system of having one scale of freight rates for fast traffic handled in small consignments, and a much lower scale for slow traffic handled in large consignments.

Practically speaking, Britain today has only a fast goods traffic, handled in small consignments and in consequence the railways cannot afford to make any lower rates.

Plainly, the problem of reducing the cost of transportation in this country is a very complex one, and will not be solved merely by changes in the structures and operating methods of the railways themselves.

Standardization of Rolling Stock

One of the phases of the railway problem in the United States which has been much discussed during the present year has been that of standardization—especially standardization of rolling stock. It is interesting to find that the same subject is being animatedly discussed here, and that the discussion is following lines somewhat similar to those being followed in the United States. Immediately, one gets into the discussion here, however, he finds as regards rolling stock the same general condition that he finds as regards track clearances—viz., that the diversity in design and construction on the 25,000 miles of railway in these islands actually is much greater than it is on the 300,000 miles in the United States and Canada. In view of the criticisms—often based mainly on ignorance—which recently have been visited upon American railways for not having standardized enough, it is somewhat amusing to come over here, and hear much of the standardizing which actually has been done on American railways held up as a model highly worthy to be followed by the British railways. Some time ago the British Government organized a Ministry of Reconstruction to study the many after-the-war problems of industry. Among the numerous committees which this ministry appointed was one to investigate and report upon the subject of "Standardization of Railway Equipment." This committee, of which Charles Metcalfe was acting chairman, heard evidence from several witnesses, including the chief mechanical engineers of the Great Western, the Lancashire & Yorkshire, the Southeastern & Chatham, and the London & North-Western Railways, representatives of the large manufacturers of rolling stock, Sir John Aspinall, and Col. Pringle, the Chief Inspector of Railways of the Board of Trade (a government department). The report which recently has been made by the Committee on Standardization, will, I am sure, be found interesting, both by American railway officers, and by American manufacturers of railway equipment and supplies, and I therefore give it below in full, together with the conclusions reached:

Report of the Standardization Committee

It is evident that standardization of railway equipment where it is possible, by allowing of mass production on repetition work, tends to quicker delivery at a lower cost, because it enables a greater use of machine as against hand labor, and facilitates maintenance. This has been the experience in India, where standardization has been adopted, and we are of opinion that in countries, such as the Argentine, for instance, where the conditions are well suited for it, if the consulting engineers would agree to design standard types of locomotives and rolling stock, the results would be equally good.

The difficulties are much greater in the case of this country. Great Britain was the pioneer of railway construction. Small, independent lines have been linked up into larger systems, and consequently there are differences in structural and clearing gages and in tunnel dimensions. In the existing state of things, any locomotive designed to run on all the various lines would have to be a compromise, and would not be the best possible for each particular railway system, and without state assistance the railway companies could not meet the capital outlay which would be involved in obtaining uniformity of conditions. But so far as the main trunk lines are concerned we were informed that a reasonably efficient engine could be designed for use generally on most of them.

The development of locomotive design has now reached a stage which allows of standard types being adopted when the conditions of the road are similar. The railway companies have recognized this, and have already begun to introduce standardization in so far as each company is concerned. The London and North-Western Railway Company, for instance, which have at

present 33 types of locomotives, have now standardized three types for express passenger, for express passenger and goods, and for heavy goods, respectively, and have also largely standardized locomotive parts, such as connecting rods, coupling rods, piston rods, injectors and cylinders.

Further, the Committee on Locomotive Standardization, which was set up because the members of the Association of Railway Locomotive Engineers were of opinion that standardization was desirable, have now fixed on two standard engines with the intention to design later two engines of each type, one heavy and one light, with many of the parts common to all four. They have also instituted a Committee on Wagon and Carriage Standardization.

The railway companies, therefore, recognize the necessity of standardization, but, in view of the lack of material, they deprecate the immediate introduction of new types of standard locomotives for which new jigs, patterns and templates would be required which would cause delay and increase the number of parts and spaces to be kept in stock. In pre-war times the big railway companies built annually some 450 locomotives out of the 700 required by all the railways. During this war they have been almost wholly occupied in keeping in repair their existing stock, which may therefore be estimated to have a further life of service of probably some 15 years.

The chief mechanical experts of the main systems of British railways, however, stated that undoubtedly economies could be effected and output increased if certain parts of engines purchased from outside firms were made standard for all railway companies. In this connection they referred more particularly to wheels, axles, wheel curves, tires, etc., and also they considered that the standardization of the essential parts, such as running gear, draw gear, buffing gear, bogies, brakes and underframes, was most urgent.

Competition between the big railways has tended to progress on the whole, but has resulted in a quite unnecessary multiplication of types. The evidence before us showed that on British railways there are 200 different types of axle boxes, that every railway company had adopted different types of tires, springs and axles—that there are over 40 variations of the ordinary wagon hand-brake, that, although the railway companies have laid down standard dimensions governing the construction of private owners' wagon stock, as to their own wagons they claim independence of action, and do not comply with the Clearing House Regulations, and we would call attention to the fact that there are two different systems of continuous brakes involving a dual brake fitment in the case of stock that has to run over lines where the systems are different. In no other country has individuality been allowed so much free scope, with the result that British railways are severely handicapped, and the working of them not so economical as it might be.

Other countries have not suffered as much from this riot of individuality because almost without exception locomotives and rolling stock are purchased from private firms of manufacturers.

The only railway company outside Great Britain that manufactures most of its own stock, we were informed, is the Pennsylvania Company, in the United States, and this is done in order to keep check on the private manufacturers.

The Locomotive Manufacturers' Association pointed out that the British railway companies, who at first bought all their locomotives from private firms, first found it necessary to set up their own repair shops, then started building their own locomotives, and from this gradually extended their operations over the whole field of railway machinery. The railway companies state that they can themselves build more cheaply, that they save the manufacturers' profit, cost of advertising, etc., and have not got to build up a reserve of capital, but they allow that in their costs they do not provide for rates and taxes, ground rent and depreciation.

We were impressed with the necessity from a business point of view of having the costs of construction in the railway workshops thoroughly investigated by competent and independent audit. This the locomotive engineers of the railways said they should welcome.

We would call attention to the amount of dead weight carried on British railways. The tare of an eight-ton wagon, built to the Clearing House Regulations, is 70 per cent of the load, as against the 40 to 45 per cent of the wagons of other countries.

CONCLUSIONS

We think it desirable in the national interest to carry out standardization of railway plant as far as it is practicable to do so, and as immediate steps towards this end we recommend:

- That the standardization of wheels, axles, wheel-centers, tires, running gear, draw gear, buffing gear, bogies, brakes and underframes be dealt with immediately by the Engineering Standards Committee on which all interested, including private builders and makers of materials, should be represented, and that when such essential parts have been standardized, the adoption of the standards should be gradually enforced.

In view of the difficulties of standardizing complete locomotives and other rolling stock under existing circumstances, and of the excessive amount of dead weight now carried on British railways, we recommend:

- That a committee be formed to investigate the existing conditions of structural gages and clearances of the British railways and the loading and unloading arrangements at works and ports in order to ascertain how far uniformity could be introduced and tares reduced, and at what cost.

- That the costs of construction of locomotives and rolling stock by the railway workshops and by private firms respectively be investigated and ascertained by competent independent accountants appointed by the government.

In view of the great demand for rolling stock that there will be at the close of the war in this country and elsewhere, we feel that, in order to expedite delivery and to secure production at the lowest possible cost, standardization is very necessary for the export trade. We recommend, therefore:

- That the consulting engineers and representatives of railways financed by British capital in foreign parts and in the dominions be brought together to confer with the locomotive and wagon manufacturers in this country to determine what standardization can be effected, and that, with a view to the possibility of effecting partial international standardization, the separate committees should take cognizance of each other's investigations.

Among the points in this report which will impress the American reader are the following:

First, the Railroad Administration in the United States entered on a programme of equipment standardization practically without previous investigation, while the British are investigating first. Second, in Great Britain the British railways have built in their own shops about 65 per cent of their locomotives, while in the United States a very large majority of locomotives have been built by companies existing solely for that purpose. Third, there has been far less standardization of parts than there has been on American railways, there even being over 40 variations of the ordinary hand-brake—which is generally used here instead of engine brakes, as in the United States, and two different systems of continuous brakes in use, involving the fitting of many cars with two different kinds of brakes. Fourth, that one important reason why the subject of standardization is being so actively considered is its relationship to export trade; for the private builders of locomotives and cars in this country get about 90 per cent of their business in foreign countries and in parts of the empire outside the British isles.

Why has standardization already been carried so much farther in America than in Great Britain? Partly, undoubtedly, because most American rolling stock has been built by locomotive and car concerns devoting themselves exclusively to this business; even more largely, probably, because there has been much closer co-operation regarding matters of this kind between the railway officers of America than between the railway officers of Great Britain. The railways of the United States owe an incalculable debt to their various operating and technical associations, because it has been largely due to the discussions in their conventions, and to the recommendations they have made, that our railways have secured the standardization of design that they have secured without at the same time hampering progress of design.

As is the case in America, there are some in Britain who see the immediate gains that would be made by standardiza-

tion, but do not appreciate the bar to progress that would be established by over-standardization, while others see the danger of interfering with progress by standardization more clearly than they do the advantages that would be gained by it.

While Sir John Aspinall, in the address already quoted from, advocated a great increase of standardization—largely, I take it, along lines already adopted in America—he added: "In pressing forward the all-important question of further standardization of parts, nothing should be done to prevent the acceptance of new ideas which tend towards the improve-

ment of conditions and the economy of operation, though a nicely-balanced judgment will often be required to decide between the acceptance of some excellent new idea, and the economy to be maintained by the retention of parts which are absolutely interchangeable. In the world of mechanism there can be no finality, and we ought not to look to finality if we are to keep pace with other nations."

I hope in a later letter to compare the discussion which is going on here regarding the future relations of the railways to one another and to the State with the similar discussion which is going on in America.

New Haven Improvements at South Boston Terminal

Involve the Construction of Two Additional Main Tracks and
Depressing the Old Line. All Done Under Heavy Traffic

WORKING THROUGH a district subjected to a particularly heavy traffic the New York, New Haven & Hartford is now engaged in widening the two-track approach to its South Boston freight terminal for four tracks. This project represents an expenditure of more than \$1,000,000 and involves the placing of 16,000 cu. yd. of concrete in the retaining walls and bridge abutments, the erec-

principal terminal for the New Haven in New England. It comprises one of the most important local freight facilities in the city and a large portion of the export facilities. It is near the site of the Commonwealth and fish piers and also includes an engine terminal. As shown on the map it fronts on Boston harbor and lies adjacent to the Fort Point Channel which leads from South Bay to the harbor.



General and Detailed Locations of the Improvements

tion of 11 concrete and steel overhead highway bridges and the excavation of 110,000 cu. yd. of material, a considerable portion of which was removed from below tidewater. The work, which has been done under the necessity of maintaining an uninterrupted traffic, was begun in October, 1917, and it is now practically completed.

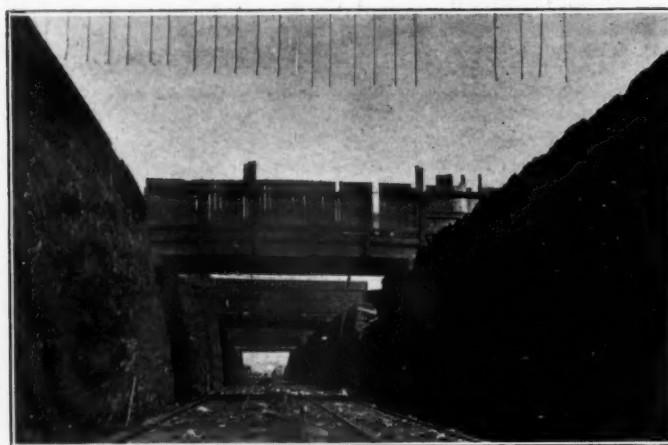
Enlarged capacity in the approach was made necessary by increasing business handled in the terminal. This is the

Since the construction of the Commonwealth pier the South Boston section has had a rapid growth as an industrial and manufacturing center, and this growth has been reflected in a corresponding increase in traffic handled. In addition to this traffic it is necessary to use the main entering and departure tracks as switching leads in connection with the classification of cars in the terminal. This switching involves an average of 1,500 movements every 24 hours.

Under the old arrangements the facilities for handling the traffic in and out of the terminal area consisted of a double track line laid in a walled cut which was built in the days of small equipment. With the introduction of modern motive power and rolling stock the clearance became inadequate. In the old layout the vertical clearance under the bridges was approximately 14 ft. 6 in., the track centers averaged about 10 ft. 10 in., and the side clearance ranged from 5 ft. 3 in. to 6 ft. At points the bulging of the old walls further reduced the clearances, making it impossible to operate the newer and larger types of engines and cars through the cut and making necessary a large amount of transfer of freight to smaller equipment before delivery to the terminal.

With the entrance of this country into the war this terminal was selected as the site for the United States government facilities for handling overseas shipments from New England. It was impossible to handle this traffic in addition to the regular business through the two-track approach and increased capacity became imperative.

As previously mentioned, the two entrance tracks to the terminal were laid in a walled cut. This cut extended from Dorchester avenue on the south, to West First street on the north, a distance of approximately 2,000 ft. In this comparatively short distance 12 streets crossed the tracks. Of



Looking Through the Cut Before Work Was Started

these, 11 were carried overhead by means of timber bridges and West First was crossed at grade.

The base of rail elevation of the old tracks in the cut averaged 6 ft. above low tide. The tide in Boston averages 9 ft., or, in other words, the old base of rail elevation was approximately 3 ft. below high water.

In making plans for the improvement, two objects were essential—the securing of the additional width in the cut necessary to permit the construction of more tracks and ample vertical clearance under the bridges to permit the operation of the largest equipment. The additional width was a problem of securing the necessary right of way, but the securing of the additional vertical clearance could be solved by raising the grade of the streets or depressing the tracks. After exhaustive studies it was decided to depress the tracks and the plans were made accordingly.

These plans provide for the replacement of the two-track approach with four tracks on 13 ft. centers, with a side clearance of 9 ft. and a vertical clearance of 17 ft. The provision of the four tracks largely increases the capacity of the approach, while the increased clearance obviates the necessity for freight transfer. In connection with the enlargement of the approach a modern classification yard is to be provided ahead of the approach tracks where all freight destined for or routed from the terminal will be classified. This further increases the capacity of the approach by doing away with the necessity for using the tracks as switching

leads. The widening of the cut required the reconstruction of the overhead highway bridges and 11 old 22-ft. span structures are being replaced with concrete and steel bridges of 57-ft. span, face to face of walls. The 17-ft. vertical clearance under the bridges was secured by fixing the new base of rail elevation at 6 ft. below high water. To secure



The Temporary Bridge at West Broadway

proper drainage for the roadbed this meant carrying the excavation down to more than 10 ft. below high water. The plans further provide for the closing of West First street across the tracks, diverting the traffic to West Second street.

Construction

Work on this project was begun on the south end and progressed to the north. The first work consisted of widening the cut. This was done by steam shovel and involved the moving of a total of 110,000 cu. yd. of excavation, including the 12,000 cu. yd. of stone removed from the old wall. The extra width was all secured on one side, the old wall on the other side being left undisturbed.

A type 60-C Bucyrus steam shovel was used, equipped with a 3½-yd. bucket. With this equipment it was possible to catch the grade with the first cut. The old wall was undermined, tipped over and loaded during the first cut of the shovel, and during the second trip the cut was widened out the required amount and the extra excavation for the bridge abutments was taken out at the same time.

A large part of the excavating was done in cold weather



Steam Shovel Making Final Cut After Walls and Abutments Have Been Completed

with a combination of 5 ft. of frost at the top and a soft bottom complicating the work. Because of the nature of the earth to be moved and the proximity of homes and industrial plants, blasting to break up the frost was not feasible to any extent. Instead it was necessary for the shovel to break up the frozen material and at times it was fitted with new manganese teeth weekly. To prevent the shovel from becoming mired it was necessary to crib it up, from three to five tiers of blocking being required.

Because of the demands of traffic, double track operation through the cut had to be maintained at all times. This complicated the disposal of the material moved, as it was necessary to use the northbound track for the work train, which cleared for all northbound movements. The material from the cut was all utilized as filling at the site of the classification yard, the average haul being approximately one mile.

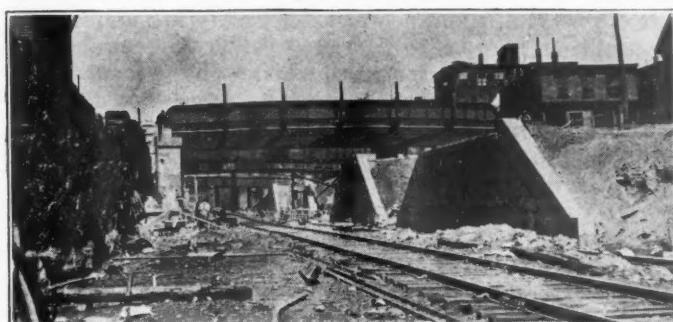
As the shovel progressed it was followed closely with a new

by 40-hp., float-controlled motors. The operation of the pumping equipment is automatic and requires little attention. The installation is in duplicate and the pumping chamber is also divided into compartments, one for each pumping unit. By this arrangement the pumps can be worked alternately. It also permits of easy repairs. Each pump has a capacity of 3,000 gallons per minute, and they work against a head of 30 ft., discharging the water into the city sewer.

The Concrete Work

In all, this project involved the placing of more than 16,000 cu. yd. of concrete, consisting of the bridge abutments at the intersecting streets, retaining walls between bridges on the east side, where the width of right-of-way is insufficient for sloped cuts, and the reinforcing of the old dry stone wall on the west side of the cut.

The stone and sand for the concrete work were purchased locally and delivered at the street level. Arrangements were also made to deliver cement at this level, although it was brought in in cars. The concreting equipment consisted chiefly of the mixer and engine, the elevation being sufficient to spout the concrete to the forms except for the retaining walls into which it was delivered from the mixer to buckets, which were picked up by a stiff-leg derrick and deposited in the forms. The retaining walls and bridge abutments are of

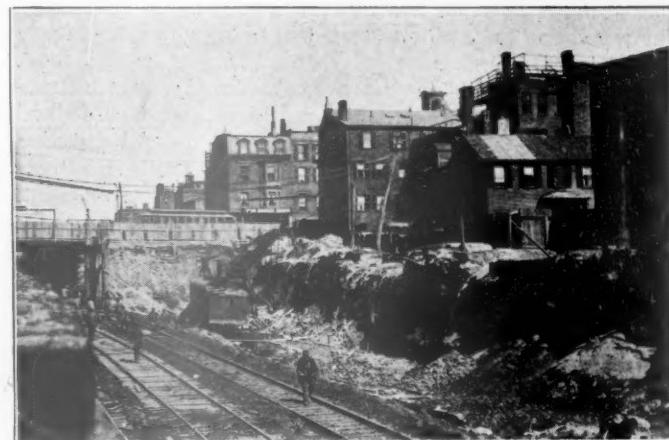


Typical Abutments and the Superstructure at West Fifth Street

track and at intervals of 500 to 600 ft. 1.5 per cent runoffs on cinders were installed between the old and new grades. The westerly track was then shifted to the position of the easterly one, thus allowing room for the construction of the west abutments of the bridges.

As the shovel progressed the material was removed to sub-grade, and provision was made for draining the roadbed. This embraced a specially constructed roadbed, an elaborate system of sewers and drains and a modern pumping plant to raise the water collected in the settling basins and discharge it into the city sewers.

In preparing the roadbed the earth and sand in the cut was taken out to an elevation of nearly three feet below the new grade of the tracks. Then 6 in. or more of cinder filling was placed on the subgrade to choke the sand and mud. This was followed by 6 in. of gravel and the whole finished with 18 in. of rock ballast below the base of rail. Three under-drains, one on each side and one in the center were provided through the entire length of the cut in addition to the main



Steam Shovel Working at West Broadway



At the Throat of the Yard

sewer, which was graduated from 15 in. at the ends to 24 in. at the pump house, the drainage being toward the center from the ends of the cut. Concrete drop inlets were provided at intervals along the underdrains, these inlets being connected with the main drains by means of cast iron pipes.

The water collected by the drainage system is discharged into a settling basin located immediately in front of the pump house. This basin is connected with a pumping chamber directly under the pump house. The pumping equipment consists of a battery of two 8-in. centrifugal pumps operated

gravity section, and because of the poor bottom special footings were provided under the abutments.

On the west side of the cut the plans provided for leaving the old dry masonry wall undisturbed. However, through the track depression it became necessary to carry the old wall down to a new footing. This was done by providing counterforts, built in 5 or 6 ft. sections and 3 to 4 ft. back under the wall. This was done by digging the dirt away from under a section of the wall after proper underpinning had been placed, following this with the concrete footing. To insure against the failure of the old wall the dirt was left undisturbed between sections of the excavation until the concrete had set properly. The intermediate sections were then reinforced in a similar way. The bridge abutments on the west side of the cut were all placed slightly ahead of the face of the old wall and thoroughly tied into it by the same method.

The service wires for the railroads are all cared for in the counterfort walls and westerly bridge abutments in six ducts built into the walls. Two ducts each are provided for the signal department and the telephone, and two for the railroad wires carrying 2,300 volts. The ducts are placed 12 in. apart and thoroughly insulated to prevent induction.

During construction it was necessary to provide means for taking care of vehicle and pedestrian traffic across the tracks as well as the public utility apparatus. For this purpose four

temporary wooden bridges, comprised of frame bents and timber floors, were installed. One at Broadway carried, in addition to a double-track trolley line, the wires of the street railway and the Edison high-tension lines to South Boston. It also carried city water pipes, gas pipes and telephones. Similar conditions were encountered at the other bridges.

All of the 11 bridges are of the through girder type. At the less important and narrow streets the bridges are provided with all-wood floors, the deck consisting of 4 in. of creosoted timber as a base, which is thoroughly waterproofed. This is followed by a sand cushion and the wearing surface of wood blocks. The steel faces exposed to the locomotive gases are wrapped with 2-in. mesh Clinton wire cloth and coated with cement applied with a cement gun. The larger bridges have concrete slab floors with the slabs poured to the bottom flanges which are left exposed and are to be coated with a cement gun. The underside of the slabs over each track are also treated with a cement gun, the treatment being about 3 ft. wide and taking the direct blast from the locomotives.

The bridge steel is being erected by the American Bridge Company with the erection derricks working from the high level of the old track, while the steel is delivered to the derricks on the new track at the lower level. To secure ample clearance to permit operation over the high level track the steel at three of the streets was landed on blocking and slacked down when the track was depressed to the new grade. The remaining bridges were seated in place with a temporary headroom of 15 ft. 6 in.

The plans for this project were developed under instructions from E. J. Pearson, then president and now federal manager of the New Haven and under the general direction of Edward Gagel, chief engineer, and A. S. Tuttle, construction engineer, who is in general charge of the improvement. J. B. Trumbull, assistant engineer, is in direct charge of the work. With the exception of the erection of the steel and the placing of the concrete, which was let to contract, the work has been carried on by the construction department of the New Haven.

Train Accidents in November¹

THE FOLLOWING is a list of the most notable train accidents that occurred on the railways of the United States in the month of November, 1918:

Collisions.						
Date	Road	Place	Kind of accident	Kind of train	Kil'd	Inj'd
†9.	Chicago, B. & Q.....	Sugar Grove	bc	P. & P.	2	13
*23.	Pennsylvania	Dewart	bc	F. & F.	6	3
Derailments						
4.	Illinois C.....	Newton	..	P.	2	1
11.	Southern	Ayrshire	..	P.	1	2
15.	Pennsylvania	Lockport	b truck	P. & F.	1	8
21.	Grand Trunk	Falmouth, Me.	b rail	P.	3	31
24.	Atlantic C. L.....	Dillon	b rail	P.	0	55
28.	Balt. & Ohio.....	Philippi	b rail	P.	0	25
29.	Atlantic C. L.....	Kingtree	unx	P.	2	0

The trains in collision at Sugar Grove, Illinois, on the 9th, were a westbound regular passenger train, and an eastbound extra passenger train being run from Camp Grant to Chicago for accommodation of soldiers attending a football game. Two passengers were killed and twelve passengers and one employee injured. The trains had orders to meet at Sugar Grove. The westbound train had been instructed by train order to take the siding, but the engineman forgot this order and continued on the main track, and collided with the other

¹Abbreviations and marks used in Accident List:
re, Rear collision—bc, Butting collision—xc, Other collisions—b, Broken—d, Defective—unf, Unforeseen obstruction—unx, Unexplained—derail, Open derailing switch—ms, Misplaced switch—acc, obst, Accidental obstruction—malice, Malicious obstruction of track, etc.—boiler, Explosion of locomotive on road—fire, Cars burned while running—P. or Pass., Passenger train—F. or Ft., Freight train (including empty engines, work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by fire—Dagger, One or more passengers killed.

train. He was running at about 10 miles an hour, and the other train about twice as fast. The eastbound engineman was also at fault for running past the block signal at the station. It appears that he expected to receive a "19" order and therefore did not try to stop his train before passing the signal.

The trains in collision near Dewart, Pa., on the 23rd were eastbound and westbound freights, the latter consisting of an engine, a caboose and no cars. Both engines and six cars were wrecked, and the wreck took fire, consuming six cars of oil. Six trainmen were killed and three were injured. The collision was due to the neglect of the signalman at Q block station. He had an order to hold westbound trains until the arrival of this eastbound train on the westbound track. He fell asleep. He awoke on the approach of the westbound train and gave it a clear signal, forgetting the holding orders.

The train derailed at Newton, Ill., on the night of the 4th, was westbound passenger No. 309. The engineman and fireman were killed, and one other employee was injured.

The train derailed on the Southern Railroad at Ayrshire, Ind., on the morning of the 11th, at 3 o'clock, was eastbound passenger No. 1. The locomotive and baggage car fell down a bank, and overturned. The engineman was killed, and the fireman and the baggageman were injured.

The accident on the Pennsylvania Railroad near Lockport, Pa., on the evening of the 15th, involved two trains, an eastbound extra freight and westbound passenger No. 5. A broken truck in the freight train derailed and wrecked twelve cars and the wreck obstructed westbound track No. 3. Train No. 5 ran into this obstruction, and the engine and first four cars were thrown off the track. The baggageman of No. 5 was killed, presumably by baggage falling upon him; and the engineman and fireman were injured. Six passengers were slightly injured.

The train derailed at Falmouth, Me., on the afternoon of the 21st, was an eastbound passenger. The smoking car was overturned. Two passengers and one employee were killed, and about 30 passengers and one employee were injured. The cause of the derailment was a broken rail.

The train derailed near Dillon, S. C., on the evening of the 24th, was northbound passenger No. 78. Fifty-five passengers were injured, all of the injuries being classed as slight. The cause of the derailment was a broken rail.

The train derailed near Philippi, W. Va., on the 28th, was northbound passenger No. 34. Fourteen passengers were slightly injured. The cause of the derailment was a broken rail.

The train derailed near Kingtree, S. C., on the morning of the 29th, about 1 o'clock, was northbound passenger No. 86. The engineman and fireman were killed and 10 employees and six passengers were injured. The cause of the derailment is reported as not determined.

Electric Car Accidents.—In Brooklyn, N.Y., on the evening of the first of November, a heavily loaded passenger train of five cars was derailed by excessive speed at a sharp curve, and 92 passengers were killed and more than 100 injured. This accident was reported in the *Railway Age* of November 8.

Fines for Rebating

In the United States court at Toledo, Ohio, on December 16, a fine of \$5,000 was imposed on the Kanawha & Michigan Railroad Company for giving rebates to Kelly's Creek Colliery Company, and one of \$1,000 on the Colliery Company for accepting the rebates. At the same time the Toledo & Ohio Central Railroad Company, which entered a plea of guilty, was fined \$1,000 for failing, for 39 days, to give the consignee notice of the arrival of a carload of coal at Toledo. These suits were based on transactions which took place more than a year ago.

Doings of the United States Railroad Administration

McAdoo Will Leave Washington About January 4, After Testifying Before Senate Committee

DIRECTOR GENERAL MCADOO has made preparations for leaving Washington about January 4, after he has presented his testimony before the Senate Committee on Interstate Commerce at the hearing which begins on January 2 regarding the disposition of the railroads. With his family he will take a vacation in southern California. Mr. McAdoo gave a dinner to the directors of his departmental divisions at his home in Washington Saturday night and has planned a reception for other members of his organization.

The appointment of a new director general to succeed Mr. McAdoo has been expected daily by cable or wireless from President Wilson for several days. It is understood that the selection of his successor was left to Mr. McAdoo when the President sailed from this country, but apparently considerable difficulty has been experienced in getting the right kind of man to take the office, as it is understood that at least three prominent men have declined the honor, including Franklin K. Lane, secretary of the interior and former member of the Interstate Commerce Commission, and Judge Robert S. Lovett, who has resigned as director of the division of capital expenditures, effective on January 1, to become president of the Union Pacific. It has been said that President Wilson was very reluctant to appoint a railroad man to the position because of the opposition which such an appointment might arouse among the labor organizations and possibly among the shippers.

On the other hand the present uncertain status of the Railroad Administration is regarded as holding little inducement to a man with a well-established reputation to accept the responsibility, because, according to present indications, the job is likely to consist largely of winding up the affairs of the Railroad Administration, which involves a settlement of the complicated relations between the government and the railroad companies and would afford little opportunity for constructive achievement. Even if the Railroad Administration were likely to be continued for a couple of years it is believed that it might be a thankless task to attempt to follow in the footsteps of a man like Mr. McAdoo, who has enjoyed such close relations with the President, who brought to the office of director general his great prestige as war-time Secretary of the Treasury, and who, because of the military necessity, was undoubtedly allowed a greater freedom of action than would be likely to be accorded to his successor. While Mr. McAdoo was called upon to deal with a difficult emergency, the fact that the emergency was so generally recognized gave him certain advantages which he himself might not be able to retain in peace times, such as the power to fix rates and wages, and thereby avoid difficulty with labor, as well as the power to put into effect measures to promote operating efficiency without the amount of pressure which shippers, state commissions, labor organizations and politicians might have been able to bring to bear in ordinary times.

Now that the war is over, shippers and state commissioners are already agitating for a reduction in the freight rates which were established by Director General McAdoo's General Order No. 28, and for a relaxation of the requirements for full loading of cars, while the coal operators are trying to bring about the discontinuance of the zone system of coal transportation, which by eliminating cross hauling is generally credited with most of the improvement in the handling of the coal traffic this year.

Many of the railroad men in the Railroad Administration

WASHINGTON, D. C.

organization who have given their best to the handling of the transportation problem during the war as the performance of a patriotic duty and at personal sacrifices, are reluctant to continue their work at Washington under peace conditions and are anxious to return to their own roads and to their homes. Two directors of departmental divisions have already resigned, and there have been many rumors that Edward Chambers, director of the Division of Traffic, would soon follow the example of Judge Lovett and Mr. Gray, while several assistant department heads would like to resign, but are conscientiously waiting to finish their work.

C. R. Gray Resigns as Director of Operation

The resignation of Carl R. Gray as director of the Division of Operation was announced by Director General McAdoo on December 20, to become effective on January 15. Mr. Gray has recently been in poor health and in a letter to Mr. McAdoo explained that he felt obliged on account of his need for a rest, to ask to be released from his duties. As the head of the operating department of the Railroad Administration, Mr. Gray and members of his staff have carried a very large proportion of the load of responsibility for the handling of the war traffic. Mr. Gray, until his appointment with the Railroad Administration, was president of the Western Maryland and the Wheeling & Lake Erie. He resigned all connection with corporate interests at that time and now has no definite plans for the future beyond a vacation. In a letter accepting his resignation, Mr. McAdoo said:

"I am genuinely distressed to learn from your letter that you feel obligated, on account of your need of a rest, to resign as director of the Division of Operation of the United States Railroad Administration, and that you would like to be released on the 15th of January, 1919.

"You have served with such marked ability, loyalty, and patriotism, and have rendered service of such great value in the responsible post you have occupied, that your resignation is a great loss to the Railroad Administration and to the country. Please be assured of my warm appreciation of your loyalty, unfailing zeal and enthusiasm during the whole period of your association with me. You have not only lightened my burdens by your effective co-operation, but you have rendered service of the highest character to your country."

Arrangements for Heavy Holiday Traffic

"Herculean efforts" are being exerted to make every provision possible to take care of the extraordinary travel on the railroads during the holiday season, according to a statement issued by the Railroad Administration. With the large number of enlisted men being furloughed and released from the various camps, coupled with the demands from the general public for railroad accommodations, it is realized that the task to be performed is a difficult one.

Reports received by the director general from the regional directors indicate that arrangements are being perfected to cover all transportation requirements, although in some instances it may not be possible to afford all the relief that will be necessary due solely to a lack of locomotives and rolling stock.

A. H. Smith, director for the Eastern region, reports that while the travel will be heavy in this section and will call for heavy trains, it is hoped to be able to give every one a seat

with the exception, perhaps, of some short haul travel. Arrangements have been made to run light sections, returning with equipment to points where it is needed.

Reports from the Allegheny region show that efforts are being concentrated to provide service and equipment required and that traffic will probably be handled without inconvenience.

From the Pocahontas region reports indicate that the roads will be hard pressed on account of the movement of troops from Camp Lee. Ten thousand men from this camp have been granted furloughs and another 10,000 will be permitted to go to their homes the three days immediately preceding New Year's Day. All coaches available, however, are being furnished the Chesapeake & Ohio and the Norfolk & Western to aid in the movement.

In the Southern region a request has been made for additional coaches to assist in handling the holiday travel.

R. H. Aishton, director for the Northwestern region, reports that no difficulty is anticipated in handling all the traffic in this section during the holidays.

From the Central Western region reports show that everything possible is being done to take care of all demands. There is no reason to believe that there will be any cause for complaint in this section.

In the Southwestern region the Missouri Pacific and Cotton Belt roads will be short approximately 25 coaches due to the demand from the Texas lines for additional equipment to handle troop movement. Everything possible is being done, however, to meet the situation.

The holiday travel for 1918 is much ahead of 1917, being greatly increased by the soldier and sailor business on furlough and discharged from the service. Weather conditions have made it possible to keep trains generally on time. No unusual congestion or complaints are reported in any territory. Reports from New York, Boston, Philadelphia, Chicago and Washington indicate the soldier business was very generally ticketed at camps where ample ticket forces were provided and so did not add to the crowds of travelers at large centers.

As typical of the business and steps taken to care for it, the sales at the Grand Central Station in New York on Saturday were \$73,000. The next largest sales reported on any one day were before Labor Day, when they were \$65,000. The number of extra sleeping cars put in service out of the Grand Central Station December 21 to 24 this year were 280; in 1917, 67; in 1916, 172. On Saturday, December 21, there were 82 extra sleepers in service which is more than the number of extra sleepers in service for four days in 1917, including December 21. The conditions in the Pennsylvania terminals in New York and Philadelphia were the same as at the Grand Central. The amount of ticket sales from December 20 to 22 were 70 per cent above a year ago, namely, \$175,000, as against \$104,000. At Philadelphia the increase was but 20 per cent and at Pittsburgh there was a slight decrease.

The conditions at Washington were probably more extreme this year than at any other city. For the six days ending December 21 the total sales at the Union Station were \$328,000, compared with \$180,000 in 1917. The number of passengers was 49,000, as against 34,000 in 1917. The sales at the Consolidated Ticket Office for the same period this year were \$237,000 and the number of passengers 27,000.

In the matter of coaches there were 2,517 used this year, as against 1,953 a year ago, or an increase of 564. In the matter of sleepers and parlor cars there were 1,384 used this year, as against 923 a year ago. The advantage of advanced buying was freely advertised and responded to, and there were comparatively few cases where the accommodations desired could not be secured. One Consolidated Ticket Office in New York was kept open Sunday, and others kept open until a reasonable hour in the evening. This practice was followed generally and there was none of the crowd and rush before

ticket windows in the last few days before Christmas, the public accepting the conditions cheerfully and helping the railroad employees to avoid confusion and preserve order.

Extra precautions were taken in the matter of handling mail, express and baggage, and the results are generally reported better than last year and in some territories for several years past, there being practically no congestion or delays in the large centers.

The Export Situation

According to the report of the Exports Control Committee for the week ended December 19 the movement of grain and grain products intended for consumption overseas, continued to a marked degree. At the North Atlantic ports elevators are in position to handle all the grain available, and there is ample vessel tonnage on hand for the removal of flour and other foodstuffs. Arrangements have been made to unload on the piers a large number of cars which it is the intention to keep as a reserve supply, the ships to be fed with current arrivals. Sufficient Belgian Relief steamers arrived to clear approximately 1,000,000 bushels of grain, and it is expected that enough vessels will be available to clear about 1,500,000 bushels of grain during the coming week.

A summary of the report follows:

Continued progress is being made in disposing of United States army freight by placing such as is not required overseas in storage, and diverting to interior storage the cars that are in transit. A lot of motor trucks recently received in the East for forwarding abroad were countermanded, and these are being ordered into storage at Port Newark. About 320 cars will be forwarded to that point. The automobile passenger cars, however, will be forwarded overseas.

Owing to the number of cars for the Naval Base, South Brooklyn, now on hand (about 450 cars), further shipments have been stopped and arrangements made to expedite the handling of the cars at the Naval Base by increasing the daily deliveries.

The army will discontinue using Baltimore for overseas traffic. Hereafter all such traffic will be handled by New York and Norfolk.

The total receipts and deliveries at the North Atlantic ports as of December 17 were as follows:

	Received (In cars)	Delivered (In cars)
Export freight at North Atlantic ports, exclusive of U. S. government freight, bulk grain and coal.....	8,424	5,845
U. S. government freight on railroad operated ter- minals	3,882	4,153
Total	<hr/> 12,306	<hr/> 9,998
An accumulation of 2,308 cars.		

In accordance with recommendation of the committee the director general has given instructions that high explosive material now in cars, for which suitable storage has not been found, be taken out to sea and dumped.

An increase in the number of vessels allocated to various lines by the Shipping Board has enabled the securing of orders on a considerable quantity of commercial export freight. The British Ministry of Shipping has released for commercial purposes 10 per cent of space on liners. This space, added to the tramp tonnage released for commercial purposes, will aggregate 150,000 tons. A great increase in applications for railroad shipping permits have been filed, covering principally freight for export to South America, South Africa, Australia and the Orient.

The reported release of ocean tonnage by the war department will not be available for commercial purposes for some time yet. The co-operation of the Shipping Board is being enlisted to supply the needs of commercial exporters.

With the storage of approximately 200,000 tons of imported nitrates for account of the government at Southern ports, and with a more active movement of flour and grain for export, together with a more liberal allocation of ocean

tonnage, these ports are now showing increased activity in overseas movement, which activity should further increase during the winter months.

Announcement has been made of the organization of the South Atlantic Maritime Corporation, for the purpose of supplying steamship service from South Atlantic ports, Wilmington to Jacksonville, inclusive, to the West Indies, Central and South America.

The United States army and naval base, Charleston, S. C., now nearing completion, will be used as a debarkation port.

During the week the Southern Export Committee issued permits covering a total of 2,237 cars of grain, cotton and iron and steel articles for movement from interior points to the ports of Galveston, Texas City, Port Arthur, New Orleans, Mobile and Savannah. This does not represent the total movement of export freight through Southern ports, as it has been found necessary to subject to permit control only a limited number of commodities in order to satisfactorily regulate the movement as a whole.

For the week ended December 12 the grain and grain products situation at the various ports was easy, the stock in elevators and amounts cleared during the week being as follows:

	Stock	Cleared	Percentage lifted
North Atlantic ports	270,622 tons	171,812 tons	63.4
Gulf ports	208,514 tons	27,312 tons	13.0

At the Gulf ports the stocks on hand are still continued at a higher percentage of their capacity, due to less clearance. The vessel allocations for the remainder of the month should meet this situation. At Galveston there are seven vessels in port taking on cargoes, including 371,000 bushels of grain. At Texas City the stock in the elevator is 86 per cent of its normal capacity, with no vessels in sight. At Port Arthur one vessel is in port with grain allocation of 295,000 bushels.

At New Orleans three ships are in port with grain allocations of 400,000 bushels, and eight ships are overdue with grain allocations of 1,440,000 bushels. There is an excess accumulation of loads on wheels at New Orleans account of the Food Administration, brought about largely by the movement of rice and flour to Belgium. Three steamers are due in port this week with total rice allocations of 45,000 tons, and a large quantity of flour will also be transferred from cars direct to steamers, which will relieve the situation.

The situation in the Puget Sound District indicates an additional accumulation in the past week of 333 cars, while the situation in the San Francisco District has improved to the extent of 22 cars.

Director General's Christmas Message to Railroad Men

"Christmas this year will have a special significance to peoples everywhere. For the first time in four years the world is at peace and railroadmen can be happy in the consciousness that they have contributed their full share to this result. I shall always remember the splendid way in which they applied themselves to the task of running the railroads at a time when their efficient operation was absolutely fundamental to the winning of the war. I am proud to have been associated with them in this great job."

"The railroads have not alone carried the tremendous burden thrown upon them by the war, but they are now in better shape than ever before in our history. For the coming winter I have no fear of their ability to do the work required of them."

"And now, as I am about to sever my connections with the officers and employees of the railroads, I want to assure them of my deep regret at being forced to take this step. Among the happiest memories of my life will be those connected with my work as director general of railroads. I shall always cherish the friendships I have formed with railroad officers and employees, and I take this opportunity to assure them that although I shall no longer be their 'boss,' I shall always be their friend."

8,700,000 Troops Moved by Railroads

As demonstrating the enormous drain upon the passenger and freight railroad equipment of the nation during the war, Director General McAdoo has made public figures showing the movement of troops from the time the government took control of the railroads on January 1 to November 10. Of course, equipment while in use for this essential war purpose was not available for civilian service.

The report shows that during this period there were transported over the various government controlled roads 6,496,150 troops, and that a total of 193,002 cars were used for the movement.

From May, 1917, to November 10, 1918, there was a total of 8,714,582 troops moved over the railroads, divided as follows: Drafted men from their homes, 2,287,926; on regular trains, 1,380,564; on special troop trains, 5,046,092. The maximum number of men handled in one month was 1,147,013 in July, 1918.

The equipment furnished in 1918 was divided as follows: Standard and tourist sleeping cars and coaches, 167,232; baggage and express cars, 12,201; freight cars for special troop trains, 13,569.

From May, 1917, to November 10, 1918, the total equipment used amounted to 245,529 cars, consisting of 206,169 standard and tourist sleeping cars; 16,285 baggage and express cars and 23,075 freight cars for special troop trains. The total number of troop trains operated from May, 1917, to November 10, 1918, was 16,535, while the number of trains of the same class operated for the year 1918 amounted to 12,897.

It is estimated that approximately 400,000 men will be moved during the month of December, consisting of discharged soldiers and sailors, and miscellaneous movements between various points in the country of troops remaining in the service.

The Railroad Administration is acting in co-operation with the general staff of the army in shaping plans for moving troops from the seaboard, returning from abroad. Present arrivals are being taken care of from day to day as the necessities demand under the existing machinery and plans of the Troop Movement Section of the Railroad Administration.

The figures show that each troop train carried an average of 12.2 cars, the distance handled being 854.6 miles, the number of miles per hour being 20.0, while the number of men carried per train amounted to 443.4.

The number of men handled in Pullman cars from January 1 to November 10, 1918, was 1,868,210, while those traveling on coaches totaled 4,627,940. The number of men transferred from New York to the various ports for the same period amounted to 1,904,014. A survey made as of November 1, 1918, showed that 26,073 cars had been assigned to camp and industrial service, to regular train service to protect regular trains and to shops.

The director general calls attention to the fact that the creation of the army and the sending of approximately 2,000,000 men to ports of embarkation involved the transportation of upwards of 8,700,000 men. It is estimated that to demobilize these troops will involve the transportation of not less than 7,250,000. Methods for handling this number of troops to the best advantage are being worked out by the Railroad Administration in co-operation with the general staff. While the problems are new and cannot be dealt with upon any precedent, it is not anticipated that any insurmountable difficulty will be encountered.

At the peak of the activities incident to the prosecution of the war, it was necessary to provide for the daily movement to and from industrial plants and camps of 205,587 persons in each direction. To perform this service 2,319 passenger equipment cars were in use daily.

The Railroad Administration's weekly comparative state-

ment showing the traffic handled by the railways under federal control at 25 of the more important railroad termini of the country during the week ending November 23, shows a decrease of 8.94 per cent in the tonnage and a decrease of 12 per cent in the number of cars used, as follows:

	Cars	Tons	
Atlanta	1917	1918	1917 1918
Birmingham	2,474	1,794	60,383 45,538
Boston	5,747	5,350	303,426 245,856
Buffalo	8,589	7,118	134,803 148,027
Chicago	8,457	9,216	294,178 351,200
Charleston	50,371	46,015	1,678,659 1,619,946
Cleveland	1,142	1,880	28,287 48,005
Duluth & Superior	8,835	8,592	317,915 344,467
Galveston	22,390	9,279	980,039 351,765
Hampton Roads	1,447	1,025	33,094 23,755
Kansas City	11,090	13,004	450,547 548,829
Los Angeles	8,846	9,236	203,432 214,402
New York	1,707	1,735	42,003 39,455
New Orleans	27,197	23,518	671,268 714,819
Omaha	4,152	5,755	122,866 170,356
Portland, Oregon	4,035	3,230	110,366 94,045
Philadelphia	1,815	1,837	33,262 41,715
Pittsburgh	18,716	16,396	528,016 483,967
St. Louis	7,143	7,031	266,117 267,772
Seattle	13,781	12,758	452,788 423,357
San Francisco	2,347	2,568	70,017 73,981
Savannah	3,147	2,706	84,351 80,161
Tacoma	2,563	2,048	46,629 48,770
Twin Cities	1,316	1,304	41,234 39,561
Toledo	12,906	10,339	335,680 269,718
Total	239,621	210,861	6,998,168 687,715
Decrease		28,760	.....
Average tons per car.....		= 12.00%	= 8.94%
		32.	33.

Repairs to Freight Cars

The Division of Operation has issued a revision of Circular No. 20, regarding the limit of cost for repairs to freight cars in which rule No. 7 is changed to read as follows:

"When the cost of repairs in kind exceeds the amount which may be expended and betterments are not to be applied, repairs will not be made. The federal manager, or general manager on roads having no federal manager, will endeavor to secure an agreement with the owning corporation that such cars may be dismantled upon the basis of settlement established in the current Master Car Builders' Association rules. When such agreements have been secured he may authorize in writing that the car will be dismantled. If such an agreement has not been secured the car will not be dismantled, but will be held for disposition and the regional director advised."

Registering Claims Against Waybills

The claims and property protection section has issued Circular No. 4 as follows:

Inquiry develops that many of the railroads under federal control do not register claims against the billing, while others employ forces at considerable expense for this purpose. General Order 41 provides that loss and damage freight claims must be supported by the original bill of lading and the original paid freight receipt, and this should serve as a check against duplicate payment of claims. Therefore, effective at once, loss and damage freight claims need not be registered against the waybills solely for protection against duplicate payment.

Capital Expenditures

The Division of Capital Expenditures has compiled an additional report of authorizations and expenditures for capital account for 120 switching and terminal companies and the Pullman Car Lines. The report for Class I roads was published in our issue of December 13. The total authorizations for the 120 companies to December 1 amounted to \$54,970,132, chargeable to capital account and \$2,253,554 chargeable to operating expenses. The expenditures to November 1 were \$13,593,305 for capital account and \$494,323 for operating account. This brings the total authorizations for capital expenditures for all companies to December 1 up to \$1,254,396,158, of which \$477,211,012 was expended up to November 1. Of this \$463,617,707 was

expended by Class I roads. The percentage of expenditures was 38 for the total and 38.7 for the Class I roads.

Railroad Headquarters Moved

Director General McAdoo has ordered the removal of the headquarters of the St. Louis Southwestern of Texas from Houston back to Tyler, Texas, and those of the Texas & Pacific from Dallas back to Palestine, Texas, on account of the many protests received from the communities from which the headquarters were removed. Mr. McAdoo explained that it was necessary for this step to be taken during the war, but that he is now glad to comply with their wishes.

Contracts Signed

Director General McAdoo has signed additional contracts for the compensation of the railroads during federal control with the New York, Ontario & Western, providing for an annual payment of \$2,103,589, the Minneapolis & International, \$202,455, the Richmond, Fredericksburg & Potomac, \$1,137,373, and the Northern Pacific and its subsidiaries for \$30,130,068. He has also signed a co-operative short line contract with the Georgia Northern.

P. S. & A. Circular No. 39 Revised

In P. S. & A. Circular No. 39 (Revised) the Division of Public Service and Accounting has issued new instructions to be observed in accounting for expenditures incurred in fitting up consolidated ticket offices and the operating expenses in connection with the operation of such offices.

Group Life Insurance

THE BROOKLYN RAPID TRANSIT COMPANY, operating elevated, surface and subway railroads in Brooklyn, N. Y., has for three years past insured, partly at their own expense and partly at the company's, the lives of 7,000 of its employees. (See *Railway Age Gazette*, September 24, 1915, page 573).

President T. S. Williams, in a recent circular, gives the following notes on the result of the experiment:

"Three years of experience with group insurance among our employees indicates its profitable character to the insured."

"Employees have paid in premiums on their certificates of \$1,000 each \$99,581 and the death benefits paid to 207 families and disability benefits to one family during the three years aggregate \$207,136, making the total benefits received by beneficiaries of employees over premiums paid by employees \$107,554."

"The Brooklyn Rapid Transit Company has paid \$97,456 as its share of these premiums, but even with this additional payment the insurance company has paid out in death and disability claims \$8,098 more than it has received."

"Many of our employees have availed themselves of the privilege of taking additional insurance under the group contract by paying the entire premium thereon, which, during the three years has amounted to \$3,844. Two claims, aggregating \$6,000, have been paid on such insurance, the beneficiaries receiving, therefore, \$2,155 in excess of the premiums paid on this class of insurance."

"Clearly this arrangement would not voluntarily be continued long by the insurance company except with the hope that future results would show better returns; but our employees are secured in this insurance at present rate for another 17 years. The last year has been rather an unfortunate one on account of the reduction in the total number insured, by reason of the number of men who have left our service. It is quite evident, however, that the insurance offered to employees is the cheapest group insurance anywhere obtainable, and all of our employees who are eligible ought to take advantage of its opportunities."

Railroading Two Miles Above Sea Level

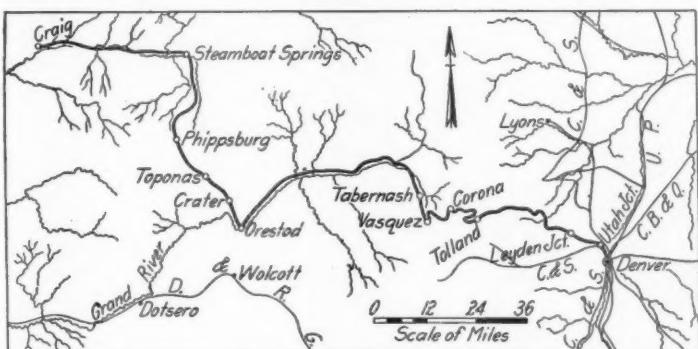
Difficulties Encountered in Raising Coal 6,900 Feet Over Summit Where Capacity of Line Is 300 Cars Per Day

A STANDARD-GAGE RAILROAD on which a movement of 150 cars each way per day requires 40 to 50 engine movements and taxes the capacity of the line is unusual among American roads. A line on which the principal traffic has to be raised vertically nearly 6,900 ft. and lowered over 8,000 ft. from origin to destination, all within a distance of 254 miles, is even more unusual. When operation is maintained throughout the year over a line with an average elevation of 8,000 ft. and a maximum of 11,660 ft. under climatic

pleted in 1905, and an extension to Steamboat Springs, 105 miles further west, was placed in service in January, 1909. In 1912 the line was again extended to Craig, 42 miles west of Steamboat Springs.

Line Has Heavy Grades

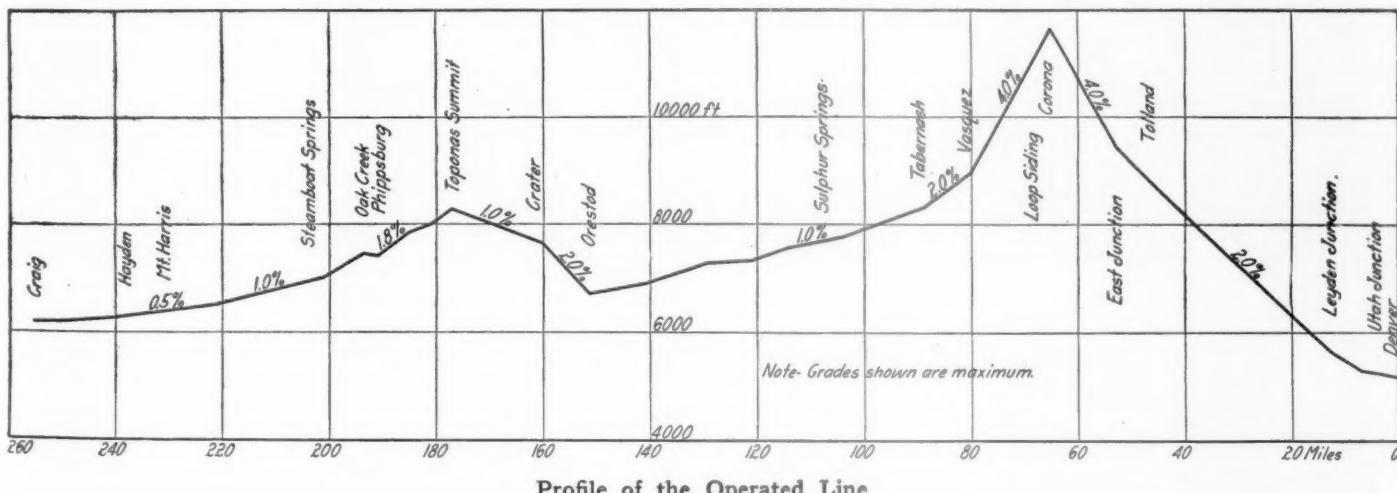
Starting from its own terminal in Denver (owned by the Northwestern Terminal Company, a subsidiary of the Denver & Salt Lake) the line plunges directly into the mountains, crossing the intervening mesas on 3.3 miles of 0.7 per cent and 9.5 miles of 1.65 per cent maximum grade. At Leyden Junction the line starts on a nearly continuous 2.00 per cent compensated grade 40.4 miles long to East Junction, a point about 6 miles beyond Tolland. Through this portion of the line the route follows the canyon of South Boulder Creek and involves heavy construction with numerous tunnels and bridges. At the end of the 2 per cent line the grade increases to 4 per cent, which is nearly continuous for over 12 miles to the summit of Rollins Pass which is crossed at Corona at an elevation of 11,660 ft. On the western slope of the Continental divide the line descends on a 4 per cent grade almost continuously for 15.22 miles to Vasquez where the grade changes to 2 per cent for 4 miles and then to 1.76 per cent for almost 10 miles through Tabernash. Beyond this point the line follows the valley of the Grand river 62 miles with a continuous descending grade of 1 per cent maximum. At Orestod where the line leaves the Grand river a minimum elevation of 6,700 ft. is reached. From this point the line again ascends to a secondary summit at Toponas, which is crossed at an elevation of 8,283 ft. This climb is negotiated by means of 10.23 miles of 2 per cent and 15.38 miles of 1 per cent grade. Beyond Toponas the line descends on grades ranging from 1.8 per cent between Toponas and Oak Hills to a maximum of 0.5 per cent west of Steamboat Springs un-



Map of the Moffat Line

conditions so severe that 19 per cent of all maintenance of way expenses for the entire year and 41 per cent of such expenses for the six months period from October to March inclusive are for the handling of snow and ice, the line stands out as unique among the railroads of this country. Such are the conditions on the Denver & Salt Lake, commonly known as the Moffat line.

The Denver & Salt Lake extends northwest from Denver



to Craig, Col., 255 miles. It was chartered on May 1, 1902, as the Denver, Northwestern & Pacific and was promoted by a group of Denver capitalists headed by D. H. Moffat for the development of extensive coal fields, timber, oil, shale, and agricultural areas in northwestern Colorado and eventual extension west to Salt Lake City, Utah, to form a short line between Denver and Salt Lake. The first section of the line from Denver to Sulphur Springs, 109 miles, was com-

til at Craig the elevation is 6,175 ft. or 1,000 ft. higher than Denver.

It will be noted that the maximum grade over the entire line is 2 per cent except for 27.63 miles between East Junction and Vasquez. When the road was built this limit was set as a maximum for the entire line and the 4 per cent grade over the summit was inserted only as a temporary expedient until a tunnel six miles long could be driven through the

continental divide. Since the line has been opened it has never been possible to finance the construction of this tunnel so the 4 per cent grade over the summit has remained in service to the present time.

The maximum degree of curve is 12 deg. except on the 4 per cent line where 16 deg. curves were permitted. Over 50 per cent of the entire mileage is curved line and on the 27.65 miles of 4 per cent line 78.3 per cent of the line is on curves and 31 per cent of this distance is on curves of 16 deg.

This road is equally remarkable with respect to tunnels. In the 215 miles east of Steamboat Springs there are 55 tunnels, 22 of which are on the 65 miles on the eastern slope. The longest tunnel is 1,729 ft. in length. The rough character of the country is indicated by the fact that in one

largely to Kansas and Nebraska points as far east as the Missouri river.

All of the coal originates west of Phippsburg (mile 191) and must be hauled over two summits into Denver. That from Mt. Harris, one of the largest shipping points, must be lifted 6,895 ft. and lowered 8,133 ft. in a distance of 231 miles, while that from Oak Creek must be raised approximately 1,000 ft. less and lowered the same amount. It is this condition combined with climatic conditions incident to the high elevation which gives rise to the operating problems encountered on this line.

Operating Conditions Are Unusual

The road is operated in three districts, the first extending from Denver over the summit to Tabernash, a distance of



On the Four Per Cent Line Between Tolland and Corona

stretch of 8 miles in South Boulder canyon on the eastern slope of the continental divide there are 11 tunnels and 22 bridges, ranging from 40 to 90 ft. in height.

Coal Is Principal Freight Handled

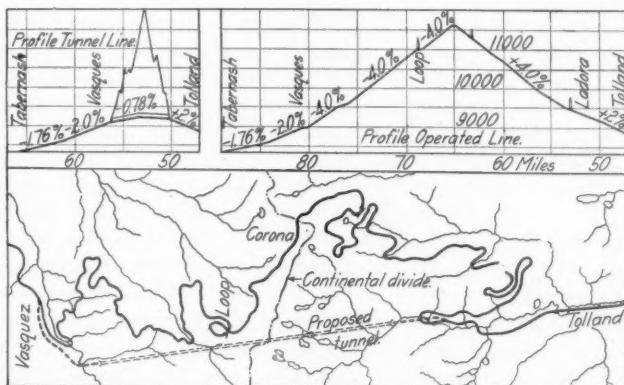
The gross revenues of the road approximated \$2,041,508 in 1917, about 15 per cent of which was derived from passenger and the remainder from freight business. The passenger traffic is that local to the line with a considerable tourist travel during the summer months. Approximately 90 per cent of the freight handled consists of coal originating in the vicinity of Mt. Harris and Oak Creek. This traffic aggregates up to 130 cars daily and could be increased considerably if the road was able to handle it. All of the coal is moved to Denver and about 80 per cent of it goes beyond,

89 miles; the second from Tabernash to Phippsburg, 102 miles; and the third to the end of the line, 64 miles. One passenger train is operated each way daily for the entire distance while freight trains are run as the traffic demands, no freight trains being scheduled.

Consolidation, Mikado and Mallet locomotives are used in freight service, their size being limited by the wheel base permissible on the sharp curves of the 4 per cent line. The Consolidation engines which are employed in road service on the first district have a rigid wheel base of 15 ft. 8 in.; weigh 219,000 lb. exclusive of tender, with 195,000 lb. on the drivers and have a tractive force of 43,980 lb. The Mikado engines which are operated on the second and third districts, have a rigid wheel base of 15 ft. 9 in.; weigh 306,000 lb. with 232,000 lb. on the drivers and have a tractive power

of 58,000 lb. The Mallet locomotives which are used in helper service between Tolland and Tabernash have a rigid wheel base of 10 ft., weigh 362,000 lb. with a weight on drivers of 332,000 lb. and have a maximum tractive effort of 78,400 lb.

From 5 to 8 freight trains are moved over the summit in each direction daily. Some of these are operated as turnarounds between Tabernash and Tolland, setting out their cars at the latter point to fill up other trains descending to Denver. Including helper engines and one passenger train each way, this involves from 40 to 50 separate movements



Map and Profile of the Line Between Tolland and Vasquez, Showing Present Route and Proposed Tunnel

over the mountain daily and taxes the capacity of this section and, therefore, that of the entire line.

The critical problem in the operation of trains on descending grades is the braking power of the equipment. The system cars are built to operate under these severe conditions and they are, therefore, equipped with more powerful brakes than some foreign cars which come on the line. For this reason freight trains made up of loaded cars for the 4 per cent grade between M. P. 53 and M. P. 80 are required to have 25 per cent system cars with air gage showing 100 lb. brake pipe pressure and 130 lb. main reservoir pressure; on light loaded and empty cars the air gage must show 80 lb. brake pipe pressure before leaving Corona. This requires much additional switching in making up trains and frequently makes it necessary to hold foreign cars at Tabernash until a sufficient number of system cars can be secured. This condition has been greatly aggravated during the past year since the rule providing for the prompt return to the home lines of foreign cars has been suspended. To insure the braking pressure on all cars stub retainers are placed on nearly all foreign cars at Tabernash. These retainers are removed at Utah Junction (Denver) and are returned to Tabernash by passenger train. A train line pressure of 100 lb. is carried on the caboose on all trains descending the mountains.

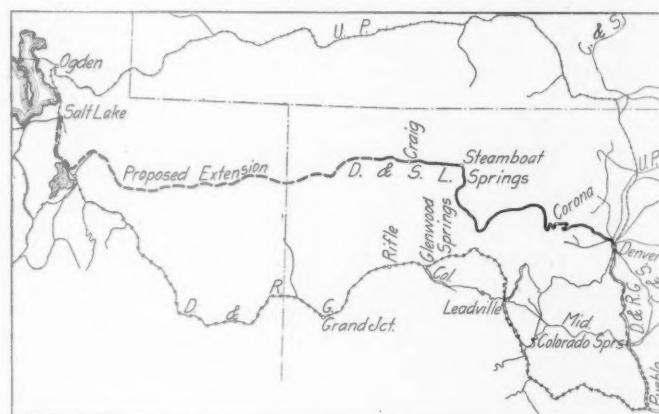
One of the most interesting operating problems arises from the adjustment of helper service to avoid excess mileage on the first district and a great deal of attention has been given to the arrangement of schedules which will accomplish this most satisfactorily. As a result in normal times it is the practice to send trains east out of Tabernash pulled by a Consolidation road engine with one Mallet helper in the center of the train and another just ahead of the caboose. Two such trains are sent up the mountain 1½ hr. apart. The two helper engines on the first train are cut out at Corona and drop back to Loop Siding at the west end of the snowshed at the summit where they meet the second train coming up the mountain. After this train passes the two helper engines continue down to the end of the 4 per cent grade at Irving, where they meet a third Consolidation engine with a train and help it up the summit, after which they return to Tabernash and lay up. If a westbound train

needs help from Tolland to Corona the helper engines on the second train are commonly sent over the summit to bring this train up to Corona, after which these helper engines proceed to Tabernash. The aim is for each set of helper engines to assist two eastbound trains or one eastbound and one westbound in each turn whenever possible. Owing to the empty movement westbound and the resulting lighter trains, only one helper, placed in the center of the train, is ordinarily used on the eastern slope.

Winter Problems Add to Complications

Severe as the operating problems are over the summit at the most favorable season, they are greatly intensified during the winter. With an average elevation of over 8,000 ft. and a maximum of 11,660 ft., severe weather conditions are to be expected. The total snowfall on the mountains throughout the year averages 64 ft., while temperatures of 40 to 50 deg. below zero are not unusual on the slope. At the summit the temperature rarely falls below 20 deg. below zero, but the winds blow continuously for days at a time at from 40 to 90 miles per hour. This not only fills the cuts, but drives the snow into the smallest crevices in the snowsheds. Instances have been reported where sufficient snow has entered the sheds through a nail hole to form a drift across the track 7 ft. deep. This makes necessary the complete closing of even very small openings in the sides or top of the sheds during the winter.

The sealing of the sheds during the winter makes it necessary to provide some means for the escape of locomotive gases, particularly at Corona, where a considerable amount of switching is done incident to the cutting out and turning of helper engines. Several plans for the ventilation of the sheds have been tried and a complete ventilation system with two 16-in. fans was installed a couple of years ago, although even this installation is effective only in the immediate vicinity of the fans. The variable direction of the wind and its intensity have made this problem one of unusual severity and particularly difficult of solution. In the summer the



The Denver & Salt Lake and the Proposed Extension to Salt Lake City in Relation to the Denver-Salt Lake Routes of the Union Pacific and the Denver & Rio Grande

sheds are opened at the sides and triangular ventilators are also placed in the roof at intervals so that there is no trouble at this season. The necessity of sealing the sheds so completely in the winter makes it necessary for bridge gangs to spend approximately two months in the fall and one month in the spring closing and opening the sheds, the openings in the sides and roof being made so the sun may thaw the accumulation of ice and snow.

Under normal conditions during the winter freight trains are run in fleets with a rotary snowplow ahead of each two

or more trains. For this purpose two rotary plows are stationed at Corona throughout the winter. The frequent use of the rotary is necessary because of the rapidity with which the cuts drift full of snow. Even with the most aggressive work the line is sometimes blocked and it is then necessary to disregard all restrictions relative to hours of service, etc., until the blockade is lifted.

The difficulty of winter operating conditions is evidenced in no way more effectively than in the precautions which are taken to insure continuity of operation. A trainmaster is stationed at Corona at the first approach of winter and he assumes charge of all trains and snowplow movements on the mountains. Special men of long experience in the mountains are also taken from section gangs about November 1 and are stationed in pairs in houses at four or five particularly troublesome points on the mountain side. They remain on duty continuously throughout the winter, subject to call at any time and are in charge of the track about one mile each way from their headquarters. They are in telephone communication with Corona and are called before any trains are started down the mountains to ascertain that the line is open. They keep the trainmaster at Corona informed regarding the velocity and direction of the wind, the depth of snow over the rail, etc.

An idea of the severity of winter conditions is obtained by the fact that 18.7 per cent of all maintenance of way expenditures for the calendar year 1916 were chargeable to the removal of snow and ice. From October, 1916, to March, 1917, inclusive, 41.6 per cent of all expenditures were for this account and they were largely incurred on the 27.65 miles of 4 per cent line. Furthermore 54 per cent of all maintenance charges were incurred during the six winter months when no renewal work was under way and efforts were being directed solely to keeping the line open.

The normal season for current renewal work is from May 1 to November 1. On about the latter date the forces are re-organized on a winter basis. While approximately the same number of men are employed on maintenance work in the winter as during the summer, a considerable number are transferred from the more level to the mountain sections to assist in keeping that section of the line open.

With the exception of a well 635 ft. deep at the eastern terminus of the line at Utah Junction, all of the supplies are from surface waters. The character of the water along the entire line is excellent and it is not necessary to treat it at any point. A number of the stations are operated by gravity. The most severe pumping problem encountered on the line is at Corona, where it is necessary to lift the water 425 ft. The consumption at this point is also very heavy, particularly during the winter.

The extreme weather conditions over the summit makes necessary the adoption of an unusual expedient to protect the telegraph lines. For a considerable distance difficulty is encountered with sleet during severe storms. To prevent this from tearing the wires down an idler pole is inserted midway between each two poles carrying the wires. These idler poles carry no crossarms, but the wires whip against them and knock the sleet off before it becomes sufficiently heavy to carry the wires down. An extra wire is also carried on the pole line near the ground for use if the others should go down.

It is evident from the above that the main problems in the operation of this line arise because of the limitations of the 4 per cent line. Not only has the traffic reached the capacity of this part of the line, but the high cost of operation and the expense of keeping the line open in winter arise very largely because of conditions existing between Tolland and Vasquez. At the time the road was built it was the expectation that the 4 per cent line would be only temporary to enable work to proceed on the western slope while a tunnel

was being driven through the main divide. Although this tunnel has been located definitely, it has not been possible to finance its construction up to the present time. The tunnel will be 6.04 miles long and its estimated cost is placed at approximately \$6,000,000.

As shown in one of the drawings, the tunnel line will leave the present line about two miles west of Tolland and will emerge about two miles southeast of Vasquez. The tunnel requires a connecting line 1.20 miles long at the east end and one 2.01 miles long at the west end, a total of 9.25 miles.

It will replace 32 miles of the present line and effect a net reduction in distance of 23 miles. It will eliminate all but two curves over 12 deg. and all of the 4 per cent grade, while it will lower the summit 2,432 ft. It will also eliminate all of the snowsheds and the severe snow troubles. From an operating standpoint it will release 25 engines at once and will double the capacity of the entire line.

Various attempts have been made to finance the construction of this tunnel during the last six years, the most conspicuous of which was an agreement ratified by the voters of Denver whereby the city was to advance part of the money in return for the right to carry water through the tunnel. The right of the city to devote funds to this purpose was later denied by the Supreme Court of the state in the year 1914, since which time the project has remained dormant until recently.

Store-Door Delivery in London

THE DELIVERY OF FREIGHT by wagon from railroad stations to merchants and manufacturers in a city, a problem now agitating New York City, is in England a well-settled industry; and yet it is not so well settled that the operations are not susceptible of improvement. The Railway Gazette, in a recent issue, contains a long account of a clearing house as despatching system which has recently been adopted by the Midland Railway for the management of its trucks which deliver and collect freight in the 43 districts of the city of London. The central control office for this despatching system is at Somers Town, and the wagons and drivers are communicated with by wire at nine main depots and numerous sub-depots. The teamsters, called carmen, report to the central office by telephone at every step of their work during the day; that is to say, usually, from every point at which they begin or end an important movement. Orders for collecting outbound freight are sent to the central office by telephone, and a principal function of this central office is to secure the execution of each such order by a cart which already is near the store or factory where the freight must be picked up. The control staff consists of a chief controller, one assistant, and six clerks, (women). Two of these attend telephones, and four are engaged in summarizing the data received from the stations. Besides the main telephone system the offices and branch offices are connected to the public telephone service; and by a special arrangement the controller can speak to all of his stations at one time.

On the long table where the women do their work there is an endless belt conveyor, by which the slips of paper, one slip to record each teamster's journey, are moved from one end of the table to the other, or to different clerks.

Records of the work done are kept in great detail, and, by means of Hollerith machines the facts contained in the records are classified in all desirable or necessary detail.

This scheme for economizing the time of the teamsters has been developed by Mr. Pepper, district goods manager for London, and very considerable economies have already been effected.

Opinion of Railway Supply Industry Sought

What Are the Views of Those Who Sell Goods or Services to Railways on a Future Transportation System?

THE COMMITTEE ON RAILWAYS after the War of the Railway Business Association has sent out the following questionnaire to its members:

President Wilson's message of December 2 and Director General McAdoo's letter of December 11 advocating a five-year period of government control have brought the country to a point where an early disposition of the railway problem is called for.

To obtain national concurrence in a solution it is desirable that the several industrial groups shall each consider the problem from the point of view not only of the national interest, but also of its own special interest, and that all groups shall then in concert endeavor to harmonize their ideas.

For us the first step is to ascertain the views of the business group which is served by the Railway Business Association.

The association will hold a railway supply men's convention at the Hotel La Salle, Chicago, in the morning, afternoon and evening of January 9, 1919. The Committee on Railways After the War will be called upon at that time to report recommendations of policy and hopes to present a consensus of opinion in the industry for discussion by those inside and outside the association who attend the meeting.

Under whatever leadership industry and commerce may take part in the discussion—and this committee assumes that the Railway Business Association will not consider itself the appropriate sponsor for a legislative program with the public—it seems essential that our officers be authorized by their constituency to stimulate public discussion along constructive and responsible lines, to record the industry within certain limits when called upon to do so, and to co-operate with members of our craft who may have occasion to participate in activities of trades or communities to which they belong as well as to co-operate with organizations in which effort may head up.

The President defined three possible alternatives—(1) restoration of conditions as they were before government control; (2) government operation and perhaps government ownership; (3) "modified private control." The director general proposes a fourth—a five-year period of government operation under an amended act.

As among these alternatives, which do those in our industry approve?

Grave objections are urged to presidential relinquishment of the roads without remedial legislation for correction of regulation. It is argued that without new conditions affecting revenue many companies under private control could not solvently cope with the financial burdens which the war emergency, through government control, has placed upon operating expenses and apparently upon income. It is asked whether the "President-made" transportation rates, if permitted to stand, would yield, in case of a moderate slump in traffic, sufficient revenue to avert numerous railway receiverships. Another inquiry is whether the "President-made" rates, lacking adoption of "a new element of policy," would be allowed to continue in force under private control in time of peace. In any event, many assert, mere cessation of government control and consequent ending of government-decreed additions and betterments charged to the corporations at war prices would not solve the problem of proceeding back even to the pre-war basis, since new capital can only be had through net earnings which will sustain credit. It is remembered that every past depression in volume of traffic has been followed but tardily and slowly by retrenchment. How much more formidable would be this obstacle

with the level of costs now prevailing and the conditions what they are as impeding readjustment? The President and the director general both volunteer the opinion that a release to the owners without modification of conditions would be a mistake, and there seems to be general concurrence in that conclusion.

Concerning government operation, with or without government ownership or government guarantee, the active propaganda in its favor has served to bring about a disclosure of how deep-seated and pervasive in this country and specifically in our industry is the conviction that for government to give up regulation is a confession of impotency and that such a course would lead to the emergence of a new America based not on the self-reliance of the citizens but upon a Prussian-like machine which would undertake to do everything for the citizens instead of providing conditions under which they could do things for themselves. Who, it is asked, have more reason than those interested in railroad-ing or in equipping railroads to be proud of their contributions toward knitting mankind closer together, or give brighter promise of affording further advancement to civilization in the same direction if permitted the necessary liberty of initiative and experiment?

"Modified private control," the third and "intermediate" alternative listed by the President, would be postponed, under the director general's five-year project, until January 1, 1924, or prevented altogether. Instant and general comment upon this proposal was that it meant the roads would never go back to private management and would ultimately pass to government ownership. This prediction was proclaimed alike by advocates and opponents of government ownership and operation. Mr. McAdoo renews his declaration of openmindedness toward the question of ultimate public or private control, but we are reminded that those who embark upon a given adventure cannot be certain of controlling its course; and that the question is not what the sponsors for a five-year control now think would be the outcome, but what would happen under the inexorable "control" of actual events. It is pointed to as significant that the open advocates of government operation and ownership are among the warmest in their espousal of the five-year control. To the suggestion that the people are entitled to a trial of government operation in peace-time the answer has been made that the people are equally entitled to a trial of non-government operation under modified regulation, and that moreover the people are entitled to say which trial they desire made, or if both, which first.

Our industry has a stake both in the ultimate disposition and in commercial conditions during any period of experiment.

We are told that in some countries state management of railways has been followed by government fostering, absorption or creation of equipment and supply industries. Some think that even though the United States government as a war measure has built munitions works, the Railroad Administration during a five-year control will refrain from the manufacture of material and parts or the assembling of cars, locomotives or other implements. There were, on the other hand, at the beginning of the present government control those who did not believe control would become operation. General anxiety, at least, is manifest over the prospect of a steady trend toward rigid and unified standardization of design and specification and toward centralization of purchases.

Interpreting what has come to it from some in the industry as an indication that our special constituency favors early return of railways to private management following remedial legislation, the committee solicits your view on the following specific aspects as to when and how such return should be accomplished:

Prompt Remedial Legislation

If the roads are to be released to their owners without needless delay and such release is to follow correction of regulatory statute and practice, what course should be pursued?

Committees of the present Congress have proceeded with preparations for the organization of information and the ascertainment of opinion and there is a wide-spread expression in favor of an extra session if necessary in order to define a policy and enact a constructive measure.

The present control act the director general declares to be unworkable; but if the present Congress can, as he proposes, provide by amendment a workable act for a five-year control we are asked why it cannot pass a control act workable for the 21 months, or for such part of that period if any as may elapse before private control has been modified and the owners have resumed management?

As for protraction of debate in the new Congress, it is recalled that an extra session was called after March 4, 1913, and that before the end of that calendar year the federal reserve act was on the statute book.

The committee requests your view upon the conclusion which follows from these considerations:

Proposition I: That if the present Congress does not reach the stage of enactment the President should call an extra session to enact provisions for modified private control, and that upon the enactment of such legislation the railroads should be restored to their owners.

Co-Operation Among Competing Roads

It is urged by railway supply men that in the general interest as well as in their special interest:

Any joint use of facilities and avoidance of wasteful duplication that are to be sanctioned should be so applied as to preserve competition among independent corporate railway organizations.

The President suggested consideration of "regional corporations under which the railways of definable areas would be in effect combined into single systems." Construction of locomotives and cars under the present government control has been carried on through unified design, specification and purchase, while in the buying of staples and parts throughout the country there has been some regional centralization.

It is inquired what would be the effect of unified determination of design and specification upon the inventor and the developer of improvements; also how would centralization of purchases affect employment of some of the many worthy competitive appliances now largely used. These apprehensions do not extend to joint use and to discontinuance of needless duplication or to concerted standardization of dimensions. Some in our craft who are the most ardent advocates of joint use and dimensional standardization are apprehensive about over-standardization of design and convinced adherents of many-minded procurement and upkeep of facilities.

Those who urge this view upon us insist that regional monopolies or any further mergers should be embraced only after it has been shown that there is no other satisfactory solution of the "rich and poor road" rate problem.

The committee would like to get your opinion upon the conclusion which follows these considerations:

Proposition II: That while permitted to co-operate with one another so as to eliminate duplication of service and facilities and to secure the most efficient and economical use

of routes, terminals and vehicles, and permitted under federal sanction to effect consolidations if essential, the properties should be operated by independent organizations as numerous as may be consistent with financial strength and stability.

Purchasing Power

The "old conditions" to which the President is unwilling to see the railways returned, were "conditions of restraint without development." They had "nothing affirmative or helpful about them." He spoke for "some new element of policy," and said, "What the country needs is that all its means of transportation be developed."

Responsibility of the government for the financial results of its regulation is for the first time actual under the present government control. The President (director general) has power to make new rates effective without suspension or investigation when in his judgment a change in total revenue is desirable. The Interstate Commerce Commission on the other hand retains its jurisdiction over the relation between one rate and another. It is being asked whether the practical response to the President's call "for a new element of policy" is not to preserve under "modified private control" this wartime practice in the regulation of rates.

We are reminded that experience during a number of years before the war demonstrated how difficult it is for foresight and forehandness through rate-making to be secured from a tribunal specially selected and trained for what the President terms "restraint." The Interstate Commerce Commission in dealing with the rights of litigants has, in almost unprecedented degree, won the public confidence as an honest, judicially-minded body. The criticism which has been visited upon it for studying the past instead of the future in determining revenue cases was merely a way of saying that a just and wise judge is not necessarily or probably a capable executive—that the administration of justice and the supervision of preparation for traffic growth are incompatible and not likely to be performed satisfactorily by one and the same person or body.

Like other shippers those in our industry prefer a reasonable stability of rates and reasonable immunity from discrimination, with prompt removal of it when created through revenue revision or otherwise; but they also require a reasonably elastic and prompt adaptation of rates to emergent and seasonal commercial conditions, adequacy of service and such stability of industry and trade as is promoted when railways can confidently plan and estimate projects of addition and betterment and the opening up of new country. It is service and prosperity that loom paramount to the minds of manufacturing and mercantile executives, alike in our craft and elsewhere. This is the consideration which leads to the proposal of an "affirmative" (to use the President's word) functionary held accountable through the commission for observance of citizens' legal rights, but primarily appointed to accomplish paramount positive results and clothed with the necessary power.

The committee requests your impression of the conclusion which follows these suggestions:

Proposition III: That Congress should adopt a policy of federal rate regulation under which a separate functionary would consider carriers' estimates of future railway traffic needs and, subject to abatement of discriminations by the Interstate Commerce Commission, would fix rates designed to yield revenue sufficient for future operations and credit.

Alba B. Johnson, president of the Railway Business Association, has filed with Ellison D. Smith, chairman of the Senate Committee on Interstate Commerce, a request for opportunity to be heard upon proposed legislation affecting railways upon some date not earlier than January 13. The association holds its convention at Chicago, January 9. Mr. Johnson says: "As a result we believe our witnesses will be put in position to speak to you with the authentic sanction

of an industry estimated to employ when times are good about as many men as do the railways, or in the neighborhood of a million and three-quarters. The association maintains entire independence of the railway corporations and managers and discusses only those phases upon which its members as business men can testify with knowledge."

Orders of Regional Directors

WORKING HOURS IN SHOPS.—In Supplement 1 to Order 141 the Southwestern regional director issued instructions regarding the period to be allowed for meals in roundhouses and other places where three eight-hour shifts are worked. Most of the agreements under which shop men provide for a lunch period of not to exceed 20 minutes, with pay, for men who are working one of the three-hour shifts. Men who are employed in shops or roundhouses or other places where less than three shifts are worked generally have a meal period of not to exceed one hour without pay. These practices, pending further action by the Railroad Administration, will govern except when more favorable conditions are provided by the agreements in effect.

Freight Destroyed in Transit.—In Circular 220 Central Western regional director calls attention to the inconvenience frequently suffered by shippers and consignees because of lack of information as to the whereabouts of their property when it is destroyed by a wreck, fire or other casualty, or is confiscated by a carrier. He directs that the roads under his jurisdiction arrange to have the operating department notify the freight claim agent immediately in all such cases, furnishing full waybill reference, name and address of shipper, consignee and a description of the freight destroyed or confiscated. Upon receipt of such advice in the claim office, the shipper and consignee should be promptly notified to enable them to make such arrangements as they deem necessary under the circumstances, either by duplication of the shipment or otherwise. The form to be used in notifying the shipper and consignee is attached to the regional director's circular.

Free Transportation.—In Circular 147 the Southwestern regional director quotes a telegram from C. R. Gray, director of the Division of Operation, which states that free transportation should not be granted to railroad men mustered out of military service, as the government allows these men mileage to their homes. The Eastern regional director has issued a similar order.

Agencies: Reconsigning and Diversion Bureau.—The Eastern regional director, file 1200-111A362, states that agencies of the bureau have been established at points as outlined below:

Station	Name of agent	Address
Chicago, Ill.	J. B. Crawford, Mgr.	58 E. Washington street.
Boston, Mass.	A. J. Brown	Room 120 B. & M. North Sta.
New York, N. Y.	G. C. Spangler	Room 472, 50 Church street.
Buffalo, N. Y.	R. H. Lewis	L. V. Loc. Frt. Office.
Cleveland, O.	E. V. Banning	c/o H. J. Merrick, N. Y. C., General Office Bldg.
Cincinnati, O.	E. Hare	Room 411, Big Four, General Office Bldg.
Detroit, Mich.	Geo. H. Hill	Michigan Central, General Office Bldg.
Indianapolis, Ind.	C. W. Hicks	Big Four, South & Delaware streets.
Pittsburgh, Pa.	C. J. Weber	613 Bessemer Bldg.
St. Louis, Mo.	Geo. A. Dearborn	408 Rialto Bldg.

The bureau is now transmitting passing information to shippers and consignees, and will handle all inquiries regarding the location of individual cars of fruits and vegetables moving from the West to Eastern destinations.

Effective January 1, the bureau will assume charge of the handling of reconsignments and diversions on shipments of fruits and vegetables in refrigerator equipment moving from the West to Eastern destinations.

Divisions or reconsignments on shipments at points where agencies are maintained, will be received by such agent direct from shipper or consignees. Shippers or consignees located at points where no agencies are maintained may place diver-

sions or reconsignments with proper railroad official as herefore. Report of such diversions or reconsignments must be mailed to J. B. Crawford.

When railroad representatives receive requests from bureau agents to reconsign or divert the request should be promptly acted upon; the bureau will have required all necessary papers for the protection of the carriers.

Recognition of the Federal Manager as the Chief Operating Officer.—The Eastern regional director, file 1500-96A-360, quotes from a letter received from the director, Division of Operation, dated December 19, relative to the authority of the federal manager as chief operating officer in wage adjustment cases as follows:

"Requirements with respect to the certification of cases to Boards of Adjustment Nos. 1, 2 and 3, are that it shall be by the chief operating officer.

"The chief operating officer, as far as we are concerned, is the federal manager. It will be understood, however, that the federal manager may delegate to his general manager or general managers, as he may see fit, the authority to certify cases to the adjustment boards, provided he files with the Division of Labor such advice, naming specifically the officer or officers to whom he delegates the authority."

The Hazard of Smoking.—In Order 142 the Southwestern regional director calls attention to the tremendous loss in railroad property and property in the care or custody of railroads as carriers which is destroyed by fire due to carelessness and indifference on the part of the employees in connection with smoking in shops, freight stations, warehouses, etc. He recommends that each federal, general or terminal manager issue a general order prohibiting smoking in shops, coaling stations, warehouses, piers, storehouses, freight houses, offices, including record rooms, and around freight platforms and in all places where inflammable materials are handled or stored. "No Smoking" signs should be posted and all watchmen and guards, officers and other employees in charge of the property must be instructed to see that the rule is rigidly enforced. The only exception to the rigid enforcement of the rule may be made in such parts of shop plants as a blacksmith shop, foundry and other places where it has been recognized that smoking does not produce any increased hazard. These exceptions may be made only at the discretion of federal managers.

Transportation for Pensioned or Furloughed Officers of Railroads.—The Eastern regional director, file 2100-50A357, states that within reasonable limits annual transportation may be given to pensioned or furloughed officers of railroads extending beyond the lines of their own railroads. Wives of deceased officers of railroads, during widowhood, may be given annual passes over the lines with which their husbands were last connected, and to a reasonable extent over other lines. In the case of pensioned officers the idea is to grant approximately such transportation as they enjoyed during the period of their last employment, and in the case of the widows of deceased officers to grant approximately the transportation they enjoyed during the lifetime, or at the time of the death of the husband; with the understanding that, when required, trip passes may be issued beyond the limits of the annual pass.

M. C. B. Brake Shoe Keys.—The Eastern regional director, file 500-70A348, advises that the executive committee of the Master Car Builders' Association, calls attention to the fact that a great number of brake shoe keys are being made which do not conform to the Master Car Builders' standard, and which are made, in many cases, of inferior material. The substitute brake shoe keys are of numerous types, with the result that they work down from the lugs of the brake head and shoe, resulting in loss of the shoe and key. Brake shoes should not be applied unless the key is provided with a head, and of sufficient strength for the service, as is shown on Master Car Builders' Sheet No. 17, Volume 51, of the Master Car Builders' Association proceedings.

Placing of Common and Semi-Skilled Labor on an Eight-Hour Basis.—The Eastern regional director, file 1200-4-56A352, states that it has been brought to his attention that

in applying Interpretations No. 1 to Supplements Nos. 7 and 8 to General Order No. 27 very substantial increases will be given to the various classes of common labor where heretofore paid on an hourly or daily basis. The indications are that labor conditions will be very much improved within the next week or two, and it appears that this would be an opportune time to place all maintenance of way common and semi-skilled labor, also other classes of common labor, on an eight-hour basis.

Rail Contracts.—The Eastern regional director, file 2800-11A359, is as follows: Please cancel any arrangement which may exist with steel mills as a war emergency to accept rails rolled from Bessemer steel upon contracts which specified open hearth steel: hereafter accept only open hearth steel upon such contracts.

Handling Expenses of American Chemical Society.—The Eastern regional director, file 102-22A361, states that under date of December 19, the American Chemical Society was advised that, until further ordered, the director general approved that society making assessments and the carriers paying the same, as may be necessary, for the current expenses of the association, such payments to be charged to operating expenses.

Uniform Highway Crossing Signs in Connecticut

ACTING UNDER A LAW adopted on May 16, 1917, the Public Utilities Commission of Connecticut last year ordered the general installation of distant cautionary signs at highway grade crossings throughout that state, and the work has been substantially carried out according to the plans; and the commission has issued regulations standardizing the practice at all classes of crossings. It has also undertaken an educational campaign to familiarize users of the highway with the meanings of the signs and the right method of approaching a crossing.

The first step toward a uniform system of marking was made when the flagmen were provided with a small disk bearing the word "STOP" instead of the white flag, which, being accepted by the driver of an automobile as a proceed signal, contributed toward a fatal accident at Berlin, Conn., in 1914. Following the action of the American Railway Association, the National Association of Railway and Utilities Commissioners, the Automobile Association and a Conference Committee of the New England Public Utilities Commissioners, a uniform system of protection was enacted into law by the Connecticut Legislature in May, 1917.

The law requires the town, city, or borough, to place and maintain the distant sign; the signs, however, to be furnished by the railroad company. Any municipality neglecting for sixty days to comply with the law must forfeit one dollar for each day of neglect.

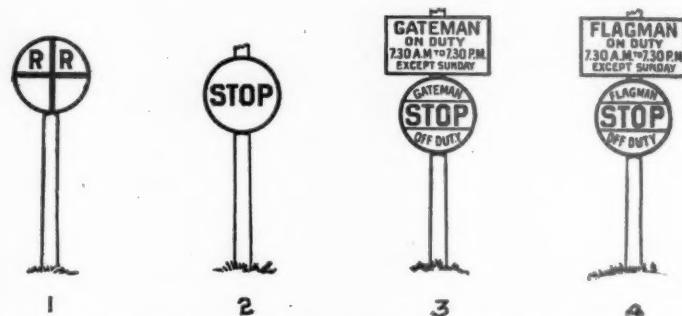
The distant warning consists of a metal disk 24 in. in diameter with white enamel field and "R. R." in black enamel. These signs are placed at the right hand side of the highway approaching the crossing and distant therefrom 300 ft. to 500 ft. In some cases of less important crossings with an unobstructed view, or in cities where the crossing is protected by gates, the statutory requirement that the town or city shall provide this distant warning is suspended by the Public Utilities Commission. Out of a total of 734 grade crossings in Connecticut this exemption has been granted in 130 cases, 44 of which are city street crossings protected by gates or flagmen.

The "stop" signs, located at the crossings, are of the same size and read either: "stop," or "stop flagman off duty," or "stop gateman off duty," or "when red, stop; train coming." All of these signs except the distant, are lighted at night by reflected light and in a number of cases where the traffic density

warrants, or where a clear view of the crossing is not obtainable, this sign is lighted also. The "flagman or gateman off duty" signs are set up by the flagman or gateman when he goes off duty, as a warning to travellers upon the highway that the crossing is not being guarded. The "When red, stop, train coming" sign is placed upon the mast supporting the "visible-audible" signal (like an enclosed-disk block signal), as an explanation of its red indication.

The type of protection to be installed at the several crossings, in addition to the approach signs, was determined through an inspection of each crossing by the chief engineer of the commission in company with the railroad officers, due weight being given to the density of traffic on the highway and on the railroad, and the view afforded the traveller on the highway and the engineman on an approaching train.

Posters, on cardboard 11 in. by 14 in., printed in two colors, showing all these types of signs have been displayed



Connecticut Standard Highway Crossing Signs

in railroad stations, garages, and hotels throughout the state. In addition, leaflets were placed in the annual report of the commission and in the registration book issued by the Motor Vehicle Commissioner of the state, and these were also distributed to persons to whom licenses were issued. The posters have been furnished to night schools for use in their courses of instruction in traffic laws.

At the present time practically all of the protective signs required by the Commissioners have been installed in the state of Connecticut, and as the travelling public becomes more and more familiar with their meaning and use, and as other states adopt this uniform system of marking crossings it may be hoped that the number of accidents at these crossings will be materially reduced.

The prescribed signs are shown in the engraving. The bulletin issued by the commission also recognizes and gives illustrations of the ordinary highway crossing signs, these presumably to be used at those minor crossings at which the provisions of this statute are suspended by the commission. The bulletin also shows highway crossing gates, diagonally striped, and a colored picture of the enclosed disk on which the lettered disk is fixed below the movable disk.

The signs which we illustrate are accompanied on the bulletin by the following explanations: (1) "Distant Warning. Reduce Speed, R. R. Crossing 300 to 500 Ft. Ahead." (2) "Caution. Dangerous. Stop, Look and Listen Before Crossing the Tracks." (3 and 4) "Caution. Dangerous Crossing. Flagman or Gateman Off Duty. Stop, Look and Listen Before Proceeding."

For the foregoing information we are indebted to E. Irvine Rudd, engineer of the Public Utilities Commission.

Marked improvement in the operation of passenger trains in the eastern section of the country is reported for November, 1918. On one division of the Pennsylvania Lines, east of Pittsburgh and Erie, for November, 88.1 per cent of the trains made schedule time as against 77.1 per cent in November, 1917.

What Time Saved by Signals Means in Equipment

A Study of Conditions on One Division of the Northern Pacific Shows Some Remarkable Results

A SAVING OF ONE HOUR in running time over a division for each freight train by the use of automatic signals may appear to be a small item, but an analysis of what such a saving means in equipment, men and money on a 100-mile division shows that it is highly important. With an average of 16 trains a day over the division this means a total saving of 16 train hours, which, as will be shown below, is equivalent to over three freight locomotives being made available for other uses, while 278 freight cars are also released, aggregating a saving involving an equipment investment of \$904,400, with a saving in overtime of approximately \$13,359.

Applying the result of this study to the lines in this country at present unsignaled, and assuming an average number of freight trains over such roads daily as 7, it is found that the total freight train hours which can be saved each day by the use of automatic block signals will amount to 17,004 hours. Such a saving is equivalent to the release of 2,902 freight locomotives and 190,138 freight cars.

Conditions Affecting the Study

In order to determine what effect automatic block signals on single track had on the speed of freight trains in an actual installation, a study has been made of train operation on the first subdivision of the Montana division of the Northern Pacific before and after the installation of signals. This division extends from Billings, Mont., to Livingston, and is 115.7 miles in length; from Billings to Laurel, a distance of 15.3 miles, the line is double track; the line between Livingston and Laurel, a distance of 100.4 miles, is single track. On this piece of single track there are 20 passing points, so that passing tracks average a little less than five miles apart. Of these 20 passing points seven have lap sidings and the capacity of each siding was 75 cars at the time automatic signals were installed, and for some time after.

The line rises almost continuously to the west, there being only seven miles of level track or descending grade westbound in this entire distance. The maximum grade westbound is 0.5 per cent, and there is over 30 miles in which the grade is 0.45 per cent or heavier.

Three-position upper-quadrant automatic signals, with a standard overlap scheme of control, were installed during 1910. There were 175 of these signals on the single-track portion of the line, or approximately 1.7 signals per mile. The maximum length of blocks between sidings is about $2\frac{1}{2}$ miles.

Between 1908 and 1912 no change was made in the number or lengths of passing sidings, but between 1912 and 1916 some passing sidings were lengthened, and during the summer of 1917 the remainder were lengthened so as to give them a capacity of 99 cars each. At the same time the signals were relocated and the control changed to the A. P. B. system. During 1908 and 1909 the freight engine division extended from Billings to Livingston. In 1910 a new yard was built at Laurel, and the engine division was shortened to extend from Laurel Yard to Livingston, a distance of 101.6 miles.

For more than 10 years the Northern Pacific has used "19" orders for despatching trains, the "31" orders being almost entirely unknown. For a part of 1909, however, an experiment was made with the A. B. C. system of train despatching. This, however, was discontinued in 1910 and the old method returned to. There are nine telegraph offices between Laurel and Livingston which are open both day and night.

In making a comparison of train speeds with and without automatic block signals, it is obvious that all conditions other

than block signals should be equal. Not only should the number and length of passing tracks be the same and the same method of despatching be followed, but the comparison should be made for periods in which the density of traffic is equal. Owing to the fact that the A. B. C. system of train despatching was used during the year previous to the installation of the automatic block signals, the year 1908 was used as typical of operation before the installation of signals.

Comparative Conditions

It was found that the greatest density of traffic on this part of the road usually occurred during the month of October. Consequently this month was used in making the comparative study. An examination of the trains recorded show that while the traffic during the months of October, 1908 and 1909, was substantially the same, that during 1911, or the first year after the installation of block signals, was considerably less. However, the traffic during the month of October, 1912, was substantially the same as in 1909. A comparison of the train sheets for these months shows that there were 20 days in the month of October, 1908, in which the number of trains of all classes operated in each day was exactly the same as on similar days in October, 1912. For example, there was one day in 1908 and one day in 1912 when 19 trains were operated; there were four days in 1908 and in 1912 when 20 trains were run, and so on, the greatest number of trains operated in one day being 25 in each case. The total number of trains handled during these 20 days was 439 in each year, an average of 21.95 trains per day. The number of passenger trains operated during this period was four each way, or a total of eight a day.

Three classes of engines were used in freight service during the period under discussion; the Class T engine with a westbound rating of 1,500 tons; the Class W engine with a westbound rating of 2,200 tons, and the Class Y-4 engine with a westbound rating of 1,800 tons. The eastbound rating for all engines was the car limit of 75 cars.

In 1908, 27.3 per cent of the trains were hauled by Class T, 53.5 per cent by Class W, and 19.2 per cent by Class Y-4 engines. In 1909 the distribution of engines was 4 per cent Class T engines, 94 per cent Class W engines, and only 2 per cent Class Y-4 engines. In 1912 no Class T engines were used; 83.3 per cent of the trains were hauled by Class W engines and 16.7 per cent by Class Y-4 engines. The average percentage of loading of all engines in 1908 was 62.5 per cent, in 1909 69.4 per cent, and in 1912 68.8 per cent.

As a basis for the comparison of speeds, the total time consumed by freight trains on the single track portion of the division was taken from the train sheet, the difference between the leaving time for westbound trains at Laurel, which is the end of double track, and the arriving time at Livingston, which includes all stops and delays, being used for arriving at the average speed of westbound trains. For eastbound trains, the difference between the time of leaving Livingston and arriving at Laurel was used in determining their average speed.

In 1908, during the 20 days which are used for comparison, 256 freight trains were operated. The total time consumed by these trains on the single track portion of the division was 2,088 hours and 28 minutes. The average time, therefore, for both eastbound and westbound freight trains during this period in 1908 was 8 hours and 9 minutes, equivalent to an average speed of 12.3 miles per hour. In 1909 225 freight trains were operated in both directions, and the time which they consumed on the single track was 1,819

hours and 23 minutes, or an average for each train of 8 hours and 5 minutes, making an average speed of 12.43 miles an hour. In 1912, 239 freight trains were operated. They consumed 1,655 hours and 51 minutes on the single-track portion of the line, or an average time of 6 hours and 56 minutes a train, which made an average speed of 14.47 miles an hour.

Possible Saving Effected by Signals

In order to show the saving in railroad equipment that would be effected by the universal use of automatic block signals, reference is made to the table on freight traffic of steam railways in the United States for nine months, April to December, 1917, inclusive, which appeared in the *Railway Age* of April 5, 1918, page 906. From this table covering a period of 275 days, the following information is obtained:

Freight train-miles	495,283,718
Freight locomotives in service and in shops	35,657
Total freight car-miles (loaded and empty)	17,310,224,064
Average miles of track operated	227,651
Revenue ton-miles	303,751,995,337
Freight cars in service and in shops	2,483,144
Per cent of freight locomotives in shops	13.8
Per cent of freight cars in shops	5.7

From the above the following is deducted:

Average freight train-miles a day:	
495,283,718 ÷ 275 =	1,801,031
Average freight train-miles per freight locomotive a day:	
1,801,031 ÷ 35,687 =	50.47
Average cars per train:	
17,310,224,064 ÷ 495,283,718 =	34.9
Average trains a day:	
1,801,031 ÷ 227,651 =	7.91
Average revenue ton-miles a day:	
303,751,995,337 ÷ 275 =	1,104,552,210
Average revenue ton-miles per freight locomotive per day:	
1,104,552,210 ÷ 35,687 =	30,951
Average car-miles a day:	
17,310,224,064 ÷ 275 =	62,946,265
Average miles per car per day:	
62,946,265 ÷ 2,483,144 =	25.3
Average revenue ton-miles per freight car per day:	
1,104,552,210 ÷ 2,483,144 =	445
Per cent of freight locomotives available for service	
86.2	
Per cent of freight cars available for service	
94.3	

There is approximately 300,000 miles of main line track in the United States. From the block signal report of the Interstate Commerce Commission, dated January 1, 1918, it is found that the total amount of track equipped with automatic block signals amounts to 57,083, or 19 per cent of the total miles of track. This leaves 242,917 miles of main line track in the United States that is not equipped with automatic block signals.

It is recognized that the automatic block system has many advantages over other methods of blocking trains and installations have demonstrated their ability to expedite traffic time after time. By their use numerous delays are eliminated and trains are enabled to cover the distance between terminal points in a shorter length of time, which frequently enables them to haul a heavier tonnage. The effect of a little saving in time on the schedule of one train may appear to be a small matter, but in the aggregate this saving capitalized amounts to considerable. Some of the results obtained from the use of signals were given in the article by Henry M. Sperry on "Train Operation by Signal Indication on the Erie," which appeared in the *Railway Age* of July 5, 1918. As pointed out in that article, a saving of 1 hour and 40 minutes was made on one division of the Erie after the installation of signals.

In order to determine what this saving in time will amount to on the average road it is necessary to make some assumptions based on facts made from previous studies. Applying this to the miles of track at present unsigned we deduce the following:

Assume:
 Average number of freight trains a day in unsignaled territory
 Average number of cars per train
 Average speed in miles an hour of freight trains, terminal to terminal
 Average saving in freight train hours per 100 freight trains
 miles, effected by automatic block signals

Then:
 Average hours per freight locomotive a day producing freight
 train hours:
 $50.47 \div 10 =$

DETAILED INFORMATION—EASTBOUND AND WESTBOUND TRAINS

Average hours per freight car a day in freight trains between terminals	2.53
Average freight train-miles a day in unsignaled territory:	
242,917 \times 7 =	1,700,419
Freight train hours saved a day by automatic block signals:	
1,700,419 \div 100 \times 1 =	17,004.2
Freight locomotives required to produce 17,004.2 freight train hours a day:	
17,004.2 \div 5.05 =	3,367
Additional freight locomotives available for service, by saving 17,004.2 freight train hours:	
3,367 \times 86.2% =	2,902
Revenue ton-miles a day that could be produced by 2,902 freight locomotives:	
30,951 \times 2,902 =	89,819,802
Train car hours saved a day by saving 17,004.2 freight train hours:	
17,044.2 \times 30 =	510,126
Freight cars required to produce 510,126 train car hours a day:	
510,126 \div 2.53 =	201,631
Additional freight cars available for service due to saving 17,004.2 freight train hours a day:	
201,631 \times 94.3% =	190,138
Revenue ton-miles a day that could be produced by 190,138 freight cars:	
190,138 \times 445 =	84,611,410

Again applying this study to a typical 100-mile division the following interesting results are obtained:

Assume:	
Average number of freight trains a day.....	16
Average number of cars per train.....	40
Average speed in miles an hour of freight trains, terminal to terminal.....	11
Average saving in freight train hours per 100 freight train miles affected by automatic block signals.....	1
Then:	
Average hours per freight locomotive a day producing freight train hours:	
50.47 \div 11 =	4.59
Average hours per freight car a day in freight trains between terminals:	
25.3 \div 11 =	2.30
Freight train-miles a day on the 100-mile division:	
16 \times 100 =	1,600
Freight train hours saved a day by automatic block signals:	
(1,600 \div 100) \times 1 =	16
Freight locomotives required to produce 16 freight train hours a day:	
16 \div 4.59 =	3.49
Additional freight locomotives available for service by saving 16 freight train hours:	
3.49 \times 86.2% =	3.00
Train car hours saved a day due to saving 16 freight train hours:	
16 \times 40 =	640
Freight cars required to produce 640 train car hours a day:	
640 \div 2.30 =	278
Additional freight cars available for service due to saving 16 freight train hours a day:	
278 \times 94.3% =	262

As a basis for still another comparison, George M. Basford, in the *Railway Age* of September 19, 1916, says that the average time a locomotive is in service a day is 4 hr. 19 min. Then, from this information and the data above, the average speed of freight trains for the nine months in 1917 in miles an hour would be

$$50.47 \div 4.31 = 11.7.$$

Average train hours per freight car a day would be:	
25.3 \div 11.7 =	2.16
Under these assumptions:	
Freight train locomotives required to produce 17,004.2 freight train hours a day:	
17,004.2 \div 4.31 =	3,945
Additional freight locomotives available for service due to saving 17,004.2 freight train hours would be:	
3,945 \times 86.2% =	3,400
Revenue ton-miles a day that could be produced by 3,400 freight locomotives would be:	
30,951 \times 3,400 =	105,233,400
Freight cars required to produce 510,126 train car hours a day would be:	
510,126 \div 2.16 =	236,170
Additional freight cars available for service due to saving 17,004.2 freight train hours a day would be:	
17,004.2 \div 2.16 =	226,708
Revenue ton-miles a day that could be produced by 226,708 freight cars would be	
226,708 \times 445 =	99,105,060

Saving in Equipment and Cost of Automatic Block

Cost of equipment saved per 100-mile division:	
3.49 freight locomotives at \$60,000.....	\$209,400
278 freight cars at \$2,500.....	695,000
Total	\$904,400
Cost of automatic block:	
100 miles of line at \$2,500.....	\$250,000
Cost of operating and maintaining automatic block a year:	
100 miles of line at \$115.....	11,500
Saving in crew overtime, due to saving one hour per 100 freight train miles:	
Total hours saved a day.....	16
Total hours saved a year.....	5,840
Average overtime 75% of total hours saved.....	4,380
At \$3.05 per hour =	\$13,359

A saving of 17,004 freight train hours a day means also

a saving of 17,004 crew hours, or on an 8 hour a day basis, a saving of 2,127 crew days, so that the additional men available for service due to installation of automatic block signals will be

$$2,127 \times 5 = 10,635.$$

Saving of 16 freight train hours a day on a 100-mile division means a saving of 16 crew hours, or on an 8 hour a day basis, two crew days, so that 10 additional men are available for service due to installation of automatic block signals on 100 miles of line on which there is an average of 16 freight trains a day.

Timetables in Border Territory

THE ORDER of the Interstate Commerce Commission, of October 24, fixing the boundaries of the different standard time zones allowed exceptions, in certain cases, whereby a railroad was permitted to run its trains, for example, from the Eastern standard zone into the Central standard zone while yet retaining Eastern time; but in such cases

37 Daily	39 Daily	43 Daily	41 Daily	Mis	Central Time	Mis	42 Daily	44 Daily	40 Daily	38 Daily
6.50	11.10	2.20	b 6.30	0	Lv Lincoln 1...Ar	841	12.50	12.15	4.10	10.20
7.09	11.25			8	Emerald	833		3.47	10.00	
7.21	11.35			14	Pleasant Dale	824		3.31	9.45	
7.35	11.49			20	Milford	822		3.15	9.30	
7.43	12.05			24	Ruby	817		3.05	9.15	
7.56	12.20	3.12	b 7.22	29	Seward, 55,	812	11.54	11.25	2.55	9.05
8.10	12.35			36	Tamora	805		2.38	8.51	
8.22	12.48			42	Utica	799		2.23	8.40	
8.33	1.01			49	Waco	783		2.08	8.25	
8.48	1.20	3.52	b 8.06	56	York, 60	786	11.12	10.37	1.54	8.10
9.03	1.36			64	Bradshaw	777		1.36	7.50	
9.16	1.53			71	Hampton	770		1.20	7.35	
9.33	2.05	4.32	b 8.41	77	Ar Aurora {Lv	764	10.37	10.01	1.05	7.20
9.33	2.25	4.32	b 8.41	77	Lv 61, 62, 63, 64 Ar	764	10.37	10.01	1.05	7.20
9.47	2.34			83	Murphy	758		12.38	7.00	
10.02	2.44			89	Phillips	753		12.29	6.50	
10.26	3.19	5.10	b 9.15	96	Grand Island	745	10.00	9.16	12.16	6.35
10.38	3.29			103	Taylor's Spur	738		11.49	6.14	
10.43	3.34			105	Abbott	737		11.46	6.08	
10.57	3.50			112	Cairo	730		11.34	5.57	
11.10	4.05			119	St. Michael	722		11.20	5.42	
11.25	4.30	6.15	b 10.20	128	Ravenna	714	9.05	8.20	11.05	5.25
PM	4.42			133	Sweetwater	708		10.57	AM	
	4.53			138	Hazard	704		g		
	5.08	e		144	Litchfield	697		g	10.30	
	5.30	7.05		154	Mason	688		6.10	10.05	
	5.47	7.20		160	Ansley	681		6.57	9.50	
	6.02			168	Berwyn	674		j	9.33	
	6.30	8.00	b 11.50	176	Broken Bow	665	7.18	6.30	9.18	
	6.42			181	Ernst	661		g	9.03	
	6.53	8.19		185	Merna, Lv	657		6.08	8.56	

Mountain Time										
3.30	5.15	b 9.20	128	Lv e	Ravenna s, Ar	714	8.05	7.20	10.05	
3.42			133		Sweetwater	708		9.57		
3.53			138		Hazard	704		9.46		
4.08	e		144		Litchfield	697		g	9.30	
4.30	6.05		154		Mason	688		6.10	9.05	
4.47	6.20		160		Ansley	681		5.57	8.50	
5.02			168		Berwyn	674		j	8.33	
5.30	7.00	b 10.50	176		Broken Bow	665	6.18	6.30	8.18	
5.42			181		Ernst	661		g	8.03	
5.53	7.19		185	Lv	Merna, Lv	657		5.08	7.56	

C. B. & Q. R. R. Timetable

the railroads were called upon to prepare their public timetables so as to show the time prescribed for the Central zone; in other words to use two times, one for the operation of trains and one for the information of the public. Bulletin boards at stations would also have to follow the same rule.

An extract from a timetable prepared to comply with this requirement of the Commission, that of the Chicago, Burlington & Quincy, is shown herewith. In this case the road is authorized to extend Mountain time eastward into Central territory, 57 miles, from Merna, Neb., to Ravenna. The only town of considerable size in this section is Broken Bow, the population of which is about 4,000. The folder shows two complete tables for the ten stations affected. In these stations the clocks will show Central time; but in the operation of trains Mountain time will be used.

Anselmo, the station next west of Merna, appears at the

top of the next column of the folder. The new arrangement goes into effect on January 1, at 2 a. m.

A prominent road in Ohio which is to extend Central time eastward, about 50 miles, into the Eastern zone proposes to print its folders just as before except that in the Eastern zone, where Central time is used by the trainmen, the figures in the folders (showing Eastern time) shall appear in italics, with a notice, in bold type, calling attention to the italics.

Experiences of an American Railroad Engineer in France

ANY RAILROAD MAN in the operating or mechanical departments inclined to feel at all discouraged at the increased difficulties of his job due to war conditions, should find a strong tonic in the following extracts from a letter written to W. O. Thompson, secretary of the Traveling Engineers' Association, by a member of the association now serving in an engineering regiment overseas. The letter was written "Somewhere in France," on July 29, 1918.

"The first work that fell to my lot was the unloading of American and Baldwin locomotives from transports. . . . I was assistant in charge of the unloading docks, and also had the honor of unloading some of the first locomotives that arrived on this side.

"During the time that I was employed on the docks, we had at times as high as eight transports having locomotives on board awaiting a berth at a dock for unloading. Considering the number of packages that the locomotive parts are encased in and the facilities for handling them, it was considered a fair day's work if we unloaded between two and three complete locomotives. . . .

"The first yard and switching work by the Americans was done with French locomotives, and certain tracks were assigned to them for their own operation. The men for these crews were furnished by this regiment and assigned to the Railway Transportation Corps for duty, they at that time not having any enlisted men. As our shipping tonnage increased, our yard facilities had to increase correspondingly, until finally all of the yard trackage was turned over to us for operation, with the exception of the receiving and departure yards, which are still being handled by the French.

"The majority of our boys who were engineers in the States were fortunate or unfortunate enough to be running a modern American locomotive when they enlisted. Then to come over here and to climb upon one of these French locomotives was enough to almost break some of them. The majority of French locomotives, and especially the ones in yard service, are not equipped with air brakes, having only a hand brake, and that connected to only one pair of drivers; if the locomotive is equipped with a tender the brakes are then on the tender instead of the drivers. The reversing gear is of the screw type. The throttle levers are of all types, and are not connected in the same place on any two locomotives.

"The speed of a moving locomotive or cut of cars in the yards is four miles per hour, and a flagman must precede the locomotive or cars on foot and at least 65 ft. in advance, waving a red flag and blowing a tin horn. From this you might judge what a good time some of our hoggers and switchmen had breaking in over here.

"After the first of the year I was recalled to my regiment and sent out to this place for duty with them. This is to be one of the largest storage and railway yards that the Americans will have over here. . . .

"We had only one locomotive in service here at that time. It was being used for work train and switching service and was of French type, built in the year 1862, and weighed

about sixty tons—so evidently it was some "baby" in its day. In addition to three locomotive cranes, this made up the mechanical department of this regiment, and I was sent out here to look after it; but it did not remain this size long—in fact, it began to grow immediately. The work was soon too heavy for one locomotive, and we had to make arrangements for another one.

"This new addition arrived a few days after I did, and it sure was a sight to look at—hardly larger than a push car, and resembled a watch charm more than it did a locomotive. It was entirely too small for the work it was to do; but it was the best we could get just at that time, so we had to make it do.

"It was of French pattern of the 2-4-0 type having only 10 in. cylinders and 60 in. drivers with side tanks and equipped with the Walschaert valve gear. This gear being put up backwards, to go ahead the reverse lever had to be in the back motion, and the reverse to back up. It also was equipped with an 8½-in. Westinghouse air pump, brake valve, train and air signal line, but no brakes on the engine, except the hand brakes. We were using very bad water at this time, but "very bad" is a mild term for it—in fact, it was the very worst that I had ever been obliged to try to use in the boiler of a locomotive, and you can believe me, I have handled some bad water in my time. I had the water analyzed, and if one of our American boiler water chemists could have seen the complete analysis, he would have thrown up both hands and yelled, "Bloody murder!" But it was all that we had to use, it being impossible to obtain good water at that time. We now have a pipe line extended out to here, and are getting fairly good water at present.

"It was not long before the boilers began to suffer from the use of this water. When we tried to work the flues of this little "bird," we found that the smallest man we had could not get into the fire-box through the fire-door, so we had to drop the ash-pans and take out the grates, to enable the boilermaker to get at the flues. As this was almost a daily occurrence and as the engine could only handle three or four French wagons at a time, it was more of a hindrance than a help.

"This was the beginning. In the meantime, warehouses began to spring up like mushrooms over night. As the work of construction increased, so did the mechanical end, we having the erection of steam shovels, pile drivers and locomotive cranes to do, together with the repairs of the machinery already in service. The question of labor became a serious one; competent and experienced machinists and operators were scarce, and we finally had to begin to make a few. In the meantime this regiment began to attach casual companies, labor battalions, German prisoners and civilian laborers of all nationalities for work on this one project.

"The French equipment, as I have stated before, is not what our men have been used to. In doing switching, the switchman has to crawl under the bumpers and unhook the link from the hook, and then kick the cars. The French use the hump in doing their switching and classifying. As a cut of cars come up over the hump, a switchman goes along the cut of cars with a long pole and reaches over the bumpers with it and lifts the link off the hook. This saves him from the danger of crawling under the bumpers and between the cars. As the wagons (this is the name the French have for cars) have no brakes, handholds or ladders on which to hold or stop a car with, they have what is called a "shoe" to do the stopping with. As a car or cut of cars comes down the hump, a shoe is placed on the rail a short distance from where they want the car to stop. As the wheels of the car strike this shoe, they are locked and the car skids to a stop. How would such a method as this work out in the States? Not a success, I should say, and the French have found out the same thing. When the U. S. A. cars began to arrive,

the French tried this system on them. They stopped all right, but also succeeded in tying up the yards for about 12 hours.

"As the freight cars have no air on them and very few have hand brakes, the trains are made up in such a manner as to have the brake cars spaced about 10 cars apart and a brakeman stationed on each one of them. A car having hand brakes is easily recognized, as it is equipped with a lookout or cupola. It is in this that the brakeman rides over the road, and from all appearances I don't think that it is a very comfortable job, especially in the winter time.

"Some of the locomotives are equipped with air. The equipment is of the Westinghouse European type and is very old. Some have the old three-way brake valve and others the D-5 valve, and I have yet to see my first locomotive over here equipped with the G-6 brake valve.

"The steam valves are mostly of the plug type, and the steam pipes and boiler connections are flanged joints; in fact, all of the boiler connections are flanged.

"The running gear is of all types, some with the main rods on the inside and some on the outside of the frames. Some have the side rods connected on to cranks, and this type have the frames and boxes on the outside of the drivers, though a few have the frames, boxes, valve gear, main and side rods on the outside of the drivers. The same can be said of the valve gears.

"As to valve and cylinder trouble, we have so far had none, but I am sorry to say that other parts of the machinery have suffered some. On one, a Belgian locomotive (of which several hundred were loaned to the American Expeditionary Forces by the Belgian government), we had a driver loosen up and slip out on the axle. This engine was of the type having the side rods, boxes and frames on the outside of the drivers, the balance of the running and valve gear being between the frames. As this engine was forever getting off the track, we could not figure out where the trouble was, as everything seemed to be all right; but upon trammimg the drivers, we found the main drivers considerably out of tram. As we could not get the oil cellar out of the right main driving box, we had to break it. This cellar was of the type that fitted up between the jaws of the box, and was held in place by two cellar bolts running through the lower end of the box and under the cellar. Another peculiarity of this type of engine is that when a box has to be packed, the frames and boiler have to be jacked up until the pedestal jaws clear the cellar bolt heads, before they can be gotten out and the cellar let down. When we broke the cellar, we found that the driver had slipped out about an inch on the axle, wearing a lip on the inner edge of the wheel hub, this in turn wearing and cutting into the box, brass and cellar. As the box was between the side rod crank and driver, you can readily see that there was small chance of getting the box off of the journal. This lip had to be chiseled off before we could get the box out. As we had no drop pits, we had to jack the frames and boiler up clear of the drivers. The job of facing off the hub and bolting on the liners had to be done by hand, as we had no lathe large enough to take this pair of drivers. The pressing of the wheel back onto the axle was accomplished by four makeshift pull jacks—four $1\frac{1}{2}$ -in. steel rods well threaded, and run through the spokes of the drivers, the nuts placed on and then tightened up. It took a six-foot bar on the wrench and two husky men to turn the trick, but it finally slipped back into place. The crown brass had to be worked over by splicing onto it the amount that was worn off, as there was no other brass of this type available. With some other repairs, the engine was again assembled and placed in service. It has now been in service about two months and so far we have not had any trouble with it. This locomotive was out of service all told fourteen days. The total labor required was 110 hours; as this was all hard work and was done by what might be termed apprentice labor, I think that it was done in record time.

"I have met and talked with members of the other railway regiments, and have heard their stories, and have reasons for envying them their experience and their good fortune in being able to see some real action; but until our work is completed here and we have new fields to go to, I guess that we will have to be contented to remain behind the S. O. S., as this work has to be done and it is up to some one to do it, and it seems as though we are the "fall guys." We have all kicked and tried our best to get out of here, but don't seem to make a go of it. I don't believe there is a man in this regiment who would not give his right hand to be able to get to the front and participate in the great struggle; but our time will come sooner or later, and when it does come I firmly believe that it will not find a man jack of the Old Seventeenth wanting.

Fraternally yours,

J. N. McVEY,
Master Engineer.
17th Railway Engineers,
American Expeditionary Forces, France.

Railway Notes From China

REPORTS COVERING THE OPERATIONS of the Chinese-Peking Government Railways during the first six months of the current year indicate an increase of about 11 per cent in operating revenue over the same period of the preceding year. It is possible that this increase will be continued during the remainder of the year, for during the late summer months of 1917 the railways suffered from disastrous floods and from military interference. Military interference continues, but the rainfall has been providentially well distributed. While the rainfall for the season is up to normal, there have been no long continued storms and the surface waters from one could drain off before another came. The Peking-Hankow line especially has been unable to rehabilitate itself, and one week of steady rain, as so often happens in interior China, would have broken up that line as badly as at the close of last season. Beyond some minor breaks, it has come through the summer whole.

The early beginning and late ending of the rainy season have produced the biggest crop in recent Chinese history. This fact instead of producing traffic is acting in the opposite direction, temporarily, at least. Last year the famine, caused in so many districts either by drought or flood, or both, required large shipments of grain into the stricken districts. This year every region is self-supporting. Buyers are offering prices much reduced, which inclines farmers to hold on to their supplies for a time. Furthermore, there is considerable impression in railway circles that the difficulty in securing cars last year has influenced "up-river" shippers to depend upon the water route entirely, whereas last year there was a large tonnage delivered to the railways by these water carriers. There is considerable evidence that Chinese shippers appreciate the regularity and certainty of railway service, but when the railway fails to provide these, they will return to the use of the slower and cheaper boats.

* * *

The departure next month from Peking of George A. Kyle, chief engineer of the lines under contract for construction by Siems-Carey Company, marks definitely the suspension of all railway construction enterprise in China for the time being. Not only internal disturbances but prices for materials have influenced the decision to cease work. In addition, the rate of exchange is prohibitive. If China were in a position to produce her own funds, this would be favorable in the extreme. But her funds must be borrowed from abroad, and when a gold dollar is converted into Chinese silver it now brings only one cent more on a dollar and much less than three years ago.

* * *

On September 17 the Peking-Hankow line started the

first agricultural demonstration train ever attempted in China. It carries with it a band of 12 pieces, three lecturers, exhibits of various sorts, and other educational material. The Peking-Hankow earns nearly half of the revenue from the carriage of agricultural products in China. Some 40 per cent of its own revenue from goods traffic is derived from products of agriculture. While the Chinese farmer has a reputation for industry, methods of intensive cultivation, and successful conservation of soil fertility that is well deserved, he is woefully deficient in some other particulars. His instruments of cultivation are, many of them, clumsy and inefficient. American plows, harrows and small tools are among the exhibits. Selection of seeds is an unknown practice. Invariably seed grains are those left over from market. Vegetable seeds are those grown from plants which matured too late for market. The effect of this in generations is well known in America, but not appreciated in China. Insect pests have been considered a dispensation of Providence rather than something which could be prevented, or at least combated. Selected seeds, charts showing relative production, and varieties of spraying apparatus are among the materials on exhibition. The train is in charge of a Chinese returned student, a graduate of Cornell.

* * *

After an interruption of months the section of the Canton-Hankow line built through as far as Changsha from Wuchang has resumed passenger traffic to the extent of one passenger train each way per day.

* * *

The prosperous suburban line running out of Canton, known as the Canton-Samshui line, has been seized by representatives of the rebellious southern provinces, and its revenues diverted to their purposes. Though only 25 miles long, and doing nothing but a passenger business, its net profits were over \$300,000 per annum.

American Railway Men in Siberia

[From the Peking Leader of September 18]

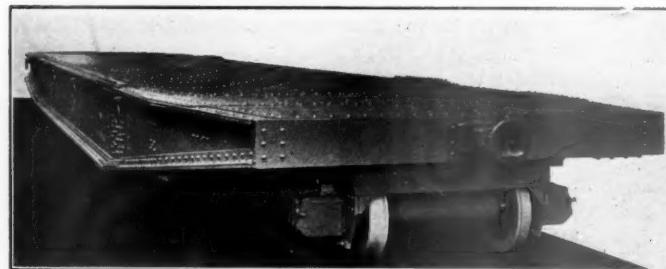
Though the American Railway Commission which was accepted by the Kerensky government have been able to do little in Russia, it has achieved wonders in an unobtrusive

the demands occasioned by the setting up of another front in Russia against the German foe. For instance, the time between Harbin and Vladivostok can be reduced by 19 hours when the service is resumed under the new conditions. That is typical of what has been done in this comparatively small section. Yet the American railway men complain that they have accomplished nothing! Now that the party of 80 men who were staying at Nagasaki awaiting the call for their services are in Siberia, working behind the Allied advance, greater things may be expected.

A Car for Carrying Whales

By Frederick C. Coleman

THE ADMINISTRATION of the Union of South Africa Railways has recently put in service a specially designed 160,000-lb. capacity all-steel bogie car for the purpose of transporting whales over a 3-ft. 6-in. gage line from the point where they are brought ashore to the factory, where they are dealt with for the extraction of oil, etc., a short distance from Durban, Natal. As shown in the photographs, the length and extraordinary width of the car are the outstanding features of the design, the length



Whale Car for the South African Railways

over buffers being 68 ft., while the width overall is no less than 12 ft. 6 1/4 in.; these are claimed to be records as far as 3 ft. 6 in. gage rolling stock is concerned. The bodies



The South African Whale Car with Its Load

manner in Siberia during the past few months. Having no authority, it did not attempt to assume any, but members going among the Russian workmen engaged on the Siberian Railway, talking to them in breezy American style, showing them things, has brought about results which have materially enhanced the efficiency of the line. American methods have been introduced in place of antiquated methods, which will enable the railway to deal with the increased demands following its reopening to traffic and especially

are hauled on to and off the wagon by windlasses. The section of line over which the car travels is very uneven, and it was necessary to design the car with six-wheel bogie trucks in order to keep the axleloads down to the required limits and ensure the necessary flexibility. The car was built by the Leeds Forge Company, Limited, of Leeds, England, under the direction of W. S. Sim, of Victoria Street, London, the supervisory engineer of the Union of South Africa Railways.

General News Department

Carrying letters by airplane regularly from New York to Chicago has not yet been accomplished. A start was made by the flyers of the Post Office department on each of four different days last week, but difficulties with engines, or with the weather, prevented satisfactory work, and the letters which started on wings had to be turned over to ordinary mail cars to complete their journey.

E. S. Rice, chief clerk to the chief engineer of the Santa Fe System, has sent to each of the 54 members of his office force, now in military or naval service, an ingenious Christmas greeting, consisting of a blue-print folder bearing the names of the honor men and containing some verses entitled "The Engineer—If," by Robert Isham Randolph. The folder is profusely illustrated with appropriate drawings.

A civil suit against an engineman, for causing a rear collision, is the latest novelty in court news. This item comes from Pittsburgh, Pa., where it is said the Pittsburgh & Lake Erie has entered suit for \$30,586 against Louis Kleitz, a former engineman of the company, who ran past an automatic block signal, set against him, and collided with a preceding train. Two men were killed. The attorney for the road says that the company desires not only to obtain reparation for its losses, but to make an example for the benefit of other employees.

Canada's Part in the War

When the war commenced in 1914, Canada had a permanent army of only 3,000 men and an active militia of 60,000. When hostilities ceased on November 11, last, the Dominion had sent overseas 418,980 men. Of the Royal Air Forces some 15,000 were recruited and trained in Canada; in addition, many joined that branch after going overseas in the Canadian Expeditionary Force. The much prized mark of valor, the Victoria Cross, was won by 43 Canadians; 491 bear the Distinguished Service Order; 1,657 the Military Cross; 6,500 others wear Military Medals, and 1,000 the Distinguished Conduct Medal. These interesting facts are contained in a pamphlet issued by the passenger department of the Canadian Pacific Railway and entitled "Their Glory Cannot Fade." The booklet also contains a list of important battles in which Canadians fought, and illustrations in colors showing the insignia of the Canadian Army.

Protest Against Consolidated Purchases

The National Bureau of Wholesale Lumber Distributors has filed a formal protest with the Central Advisory Purchasing Committee of the Railroad Administration against the centralization of the purchase of fir in the three western railroad regions. The letter says that all purchases of fir for western roads are made by a representative of the Railroad Administration at Seattle, Washington. The action of the Northwestern regional purchasing committee and that of the similar committees in the Central Western and Southwestern regions are declared to be contrary to the procedure followed in other regions and, therefore, a discrimination against the fir lumber industry.

The inevitable result of the permanent adoption of such a centralized purchasing policy, the bureau says, will be to seriously injure the lumber industry and ultimately to prejudice the best interests of the railroads. The plan will make it impossible for many of the smaller saw mills and dealers, regardless of their efficiency, to make bids. The bulk of the business will go to the large mills, driving out of the industry the smaller mills, which produce nearly 50 per cent of the fir lumber output of the country. The purchasing agents of the different lines have an acquaintance and knowledge of certain mills and distributors with whom they have been dealing, and by permitting each road to distribute its business,

as it has in the past, a much broader distribution of orders will result.

The National Bureau requests the Central Advisory Purchasing Committee to direct the regional purchasing committees to return to the old method of buying lumber through the individual railway purchasing departments.

Extension of Sailing Day Plan in Chicago

The sailing day plan, which was introduced in the Chicago terminal district on September 23, for the purpose of controlling I. c. l. movements to points in the Northwestern region, will be extended to apply to business destined to points in the Central Western and Southwestern regions, beginning December 30. The sailing day schedule and the plan for the consolidation of I. c. l. freight over definite routes to designated destinations have been modified and corrected under the direction of J. H. Brinkerhoff, terminal manager of the Chicago switching district, on the basis of experience in handling business moving to the Northwestern region.

Railway Age Representative Cited for Gallantry

George E. Goldthwait, one of the associate editors of the *Railway Age*, was enrolled in the first officers' training camp at Plattsburg immediately after the outbreak of the war. After completing the three months' course there he was assigned to the aviation section, and attended the ground school at the Massachusetts Institute of Technology. He was then sent abroad, and after a number of months' further training received his commission as first lieutenant. The following information is taken from the Marion (Ind.) Chronicle of December 14:

"Another young man from Marion has added glory to the record of Grant county's fighting men. Lieutenant George E. Goldthwait, son of Mrs. E. L. Goldthwait, Gallatin and Fifth streets, has been recommended for a distinguished service cross in France.

"The word has come first in an indirect way to his relatives. Miss Alice Goldthwait, of North Washington street, a cousin of Lieutenant Goldthwait, has received a letter from an old friend, William S. Biddle, adjutant-general of the personnel bureau of the general headquarters of the American expeditionary forces. Major Biddle is in the decoration section. It is by his kindly thought and remembrance of the family that he was inspired to tell them this good news even before Lieutenant Goldthwait had forwarded the word. Lieutenant Goldthwait is in the aviation section."

Why Not Help the Railroads Now?

In a leading editorial the Manufacturers' News (Chicago) of December 19, recommends a prompt disposition of the railroad question so that the roads may be rehabilitated promptly. It reads as follows:

No matter what disposition is made of the railroads, they will have to be refinanced. As we understand the situation, more money is being paid out for their operation and maintenance than is being taken in, and it is as simple as the nose on one's face that such a situation cannot long obtain—no business can endure under such conditions. President Wilson warned Congress, in his address on December 2, that the government was practically in the same situation as the man who had hold of the bear's tail, and that something must be done and that very soon. It has been intimated that the physical condition of the roads is not being maintained at a standard that will insure their preservation. As soon as the trains commence to jump the tracks on account of defective rails and other features of decay appear the public will rebel in a way that will put fear in the hearts of those responsible.

Why not do something now? Why wait for the evil day? Why wait for a tremendous loss of life and property? A stitch in time will save nine. Mr. McAdoo wants to try a five-year unification plan. It will take just as much money—yes, we believe it will take more money—under government direction to put the various lines in shape than if the stockholders are given their property back and permitted to do the financing. If the government wants to do the patriotic thing, let it help out in the

financing. Under the McAdoo plan it will have to furnish the money; so why squabble about it?

It was said early in the war that John Philip Sousa's band was the best organization in connection with the government because John Philip Sousa when he wanted a piccolo player hired a piccolo player. Let the same principle be applied to the carriers. There is hardly any way the business fabric of this country can be brought to grief quicker than by letting the transportation system fall down. Every branch of business is dependent on transportation. The railroads are the arteries of industry and commerce. So far as we are able to judge public sentiment it is opposed to government ownership, and this opinion is supported by the hesitation of the government to apply that remedy to the situation. The present administration has not been slow to act on any line of policy during its incumbency in office when public sentiment was pronounced, and we do not understand why it hesitates in the case of the railroads, even though its inclination toward a government ownership policy has been clearly indicated in many questions that have confronted it.

One Hundred Per Cent Lines in Central Western Loan Drive

The final returns from roads in the Central Western region show that 100 per cent of the employees of one-half of the lines in the district subscribed to the Fourth Liberty Loan. Of roads with more than 1,000 employees, the Los Angeles & Salt Lake showed the largest average individual subscription, namely \$209.60. The Northwestern Pacific was second with \$191.31. The road showing the largest total subscription was the Southern Pacific, with \$6,369,350.

SUBSCRIPTIONS TO FOURTH LIBERTY LOAN IN CENTRAL WESTERN REGION

Road	Rank	Number employees	Number subscribers	Amount subscribed to date	Per cent emp. sub- scribed	Average amount per subscriber
Un. Trml. (St. Jos.).	1	67	67	\$24,750	100	\$369.40
St. Joseph Belt....	2	94	94	30,200	100	321.68
L. A. & S. L.	3	3,716	3,716	778,900	100	209.60
Northwestern Pac....	4	1,915	1,915	366,350	100	191.31
E. P. & S. W....	5	3,524	3,524	448,600	100	127.30
Iowa Transfer....	6	10	10	1,250	100	125.00
Denver Union Trml....	7	207	207	25,600	100	123.67
C. R. I. & P....	8	26,416	26,416	3,168,300	100	119.93
Hannibal Union D....	9	19	19	2,200	100	115.78
Oregon Short Line....	10	10,576	10,576	1,187,150	100	112.25
Salt Lake U.D. & R....	11	29	29	3,250	100	112.07
Pueblo U. D. & R....	12	62	62	6,600	100	106.45
Arizona Eastern....	13	1,407	1,407	147,300	100	104.69
Kansas City Trml....	14	2,603	2,603	263,650	100	101.29
C. T. H. & S. E....	15	1,992	1,992	198,700	100	99.75
D. R. I. & N. W....	16	174	174	17,250	100	99.13
St. Joseph U. D....	17	76	76	6,950	100	91.45
Mo. & Ill. B. & B....	18	25	25	2,150	100	86.00
St. Joseph Trml....	19	120	120	10,200	100	85.00
El Paso Union Depot....	20	53	53	4,500	100	84.90
Des Moines Union....	21	442	442	33,600	100	76.02
C. & E. I....	22	10,510	10,500	1,261,500	99.9	120.14
Colorado & Southern....	23	5,051	5,046	610,000	99.9	120.88
Wabash....	24	8,232	8,203	1,006,100	99.6	122.65
C. B. & Q....	25	50,672	50,301	5,426,300	99.3	107.88
St. J. & G. I....	26	1,268	1,257	121,800	99.1	96.90
R. & P. U....	27	1,546	1,524	157,200	98.6	103.15
Southern Pacific....	28	46,735	45,753	6,369,350	97.9	139.21
Chicago & Alton....	29	8,769	8,631	1,006,750	98.4	116.64
Denver & Salt Lake....	30	1,269	1,230	182,950	96.9	148.74
Illinois Terminal....	31	215	208	13,800	96.7	66.34
Peoria Ry. Terml....	32	131	126	11,250	96.2	89.28
Union Pacific....	33	27,723	26,556	3,344,300	95.8	125.93
A. T. & S. F....	34	52,793	50,493	5,505,700	95.6	109.04
T. P. & W....	35	735	682	71,600	92.8	104.98
Illinois Central....	36	30,663	28,448	2,505,550	92.8	88.07
C. P. & St. L....	37	1,071	982	112,550	91.7	114.61
Atchison Union D....	38	22	20	2,050	90.9	102.50
R. C. B. H. & W....	39	28	25	2,250	89.2	90.00
Rio Grande Sou....	40	218	190	20,650	87.2	108.68
Western Pacific....	41	3,648	3,083	393,450	84.5	127.62
Denver & Rio Grande....	42	13,141	10,675	1,134,050	81.2	106.23
Total .....	..	317,967	307,460	\$36,016,550	96.7	\$117.14

June Mechanical Conventions

At the meeting of the executive committees of the American Railway Master Mechanics' Association, the Railway Master Car Builders' Association, and the Railway Supply Manufacturers' Association at the Hotel Biltmore, New York, last Friday, arrangements were made for the holding of a mechanical convention at Atlantic City in June. Inasmuch as the convention is a postponed one, the previous decision to meet at Atlantic City was adhered to and the dates set are June 18 to June 25; the Master Car Builders' Association being held first, June 18 to 21, and the Master Mechanics' Association from June 23 to 25. While the executive committees felt that it would be advisable to hold all the sessions during one calendar week, it was not found feasible to make such an arrangement. Frank McManamy, assistant director, Division of Operation of the Railroad Administration, was present. The decision in favor of holding the usual exhibit

of the Railway Supply Manufacturers' Association was strongly favored by all those present, the advantages to the younger men in railroad service and for visitors from other countries being very strongly presented. It was decided that all three associations unite in invitations to the representatives of foreign countries to attend the convention.

Headquarters, as in former years, will be in the Marlborough-Blenheim Hotel, and sessions will be held on the Million Dollar Pier. At a separate meeting of the executive committee of the Railway Supply Manufacturers' Association, J. D. Conway was elected secretary-treasurer.

No Store-Door Delivery in New York

Store-door delivery is not to be tried in New York City at present. This is the announcement of the Railroad Administration, after six months' preliminary work in a persistent attempt to secure the necessary agreements and concessions. Fears of small trucking concerns that under the proposed pooling arrangements their earnings would be reduced, and the claims of some merchants that the proposed new standard cartage rates would be disastrous to their business, appear to have been prominent among the reasons for the present decision. The lessening of the congestion of freight on the railroads' piers has made economy in storage space and in trucking less imperatively necessary, than was the case during the war, and so the project has failed.

Wood Preserving and Tie Men

The fifteenth annual meeting of the American Wood Preservers' Association will be held at the Hotel Statler, St. Louis, on January 28 and 29. The tie and timber division of the St. Louis Chamber of Commerce has called a meeting of the tie producers of the country for the two following days to perfect a national organization. Users and producers of cross ties will correlate their programs, the meeting of the Wood Preservers' Association being curtailed to two days with three sessions on Tuesday and two on Wednesday. On Wednesday evening there will be a joint dinner with the National Tie Producers' Association, at which it is expected that one of the officers prominent in the United States Railway Administration will be the speaker. The session on Tuesday evening will be devoted to the consideration of the preservative materials situation, and Wednesday afternoon to the tie problem.

The program for the convention of the Wood Preservers' Association is as follows:

TUESDAY MORNING

Report of committee on publications, John Foley, chairman.

Report of committee on promotion and education, C. G. Crawford, chairman.

Report of committee on terminology, W. A. Fisher, chairman.

TUESDAY AFTERNOON

Report of committee on plant operation, W. H. Grady, chairman.

Paper on Fuel Economics, by Jos. W. Hays, combustion engineer.

Report of committee on service tests, flooring and paving, A. W. Dow, chairman.

Report of committee on wood block flooring and paving, Walter Buehler, chairman.

Report of committee on preservatives, E. B. Fulks, chairman.

Paper on Marine Wood Preservation, Dr. L. F. Shackell.

The Timber Treating Plant Chemist, C. Marshall Taylor.

TUESDAY EVENING

The Sodium Fluoride Situation, by Galen Wood.

The Zinc Chloride Situation, by J. H. Jordan.

The Creosote Oil Situation, by representative manufacturers and importers.

The Transition from Creosote Oil to Zinc Chloride in the Treatment of Cross Ties, by Dr. Hermann Von Schrenk.

WEDNESDAY MORNING

Report of committee on purchase and preservation of treatable timber, H. S. Sackett, chairman.

Report of committee on non-pressure treatments, R. A. Griffin, chairman.

Election and installation of new officers.

WEDNESDAY AFTERNOON

The Car Situation, by E. H. DeGroot, Jr., assistant manager car service section, U. S. Railroad Administration.

Report of committee on service tests, ties and timber, J. H. Waterman, chairman.

Development of Uniform Practices in Procuring and Preserving Cross Ties, by John Foley, associate manager, forest products section, U. S. Railroad Administration.

REVENUES AND EXPENSES OF RAILWAYS

TEN MONTHS OF CALENDAR YEAR 1918

Name of road.	Average mileage operated during period.	Operating revenues			Maintenance of			Trans- portation.	General.	Total.	Operating ratio.	Net from railway tax accruals.	Railway tax income (or loss).	Operating comp. with last year.	Increase (or decr.)
		Freight.	Passenger. (inc. misc.)	Total	Way and structures.	Equip- ment.									
Toledo, Peoria & Western.....	247	\$887,201	\$379,770	\$1,247,618	\$95,980	\$242,041	\$25,512	\$60,640	\$53,199	\$1,357,338	100.71	-\$9,720	\$92,754	-\$102,474	-\$130,894
Toledo, St. Louis & Western.....	454	5,741,396	797,318	6,801,989	1,103,311	1,058,357	109,466	2,583,716	107,590	5,357,994	78.77	1,443,995	222,290	1,221,625	-337,180
Trinity & Brazos Valley.....	368	706,618	135,582	947,427	267,235	408,105	18,216	492,847	80,029	1,266,437	133.66	-319,006	65,218	-384,382	-96,190
Union Pacific	3,626	59,242,025	15,157,652	80,756,487	8,599,609	13,029,809	653,217	22,107,340	2,068,639	48,083,644	59.54	32,672,844	2,826,420	29,832,765	7,308,183
Union R. R. of Pennsylvania.....	35	.....	5,818,278	540,847	1,684,350	2,806	3,093,283	61,299	5,382,429	92.50	435,849	106,893	328,950	156,117	
Utah Railway	98	1,162,510	6,200	1,175,274	138,622	143,437	1,691	226,593	56,176	566,517	48.20	608,757	33,942	574,815	.....
Vicksburg, Shreveport & Pac.....	171	1,209,487	633,190	2,116,720	276,417	502,304	41,980	292,871	74,275	1,729,072	81.68	387,648	96,321	29,013	-187,847
Virginian	518	8,746,093	521,637	9,911,593	1,152,331	2,136,639	58,511	3,553,699	155,331	7,342,411	74.07	2,569,183	394,430	2,174,724	-1,442,326
Wabash	2,519	28,041,002	8,470,232	39,118,660	4,874,215	7,099,481	620,605	18,294,387	896,900	32,784,025	83.16	6,634,635	1,123,333	5,509,382	-3,612,167
Washington Southern	35	867,096	1,719,579	3,100,350	206,524	305,893	17,981	1,032,418	49,389	1,632,833	52.66	1,468,017	61,897	1,406,067	549,193
West Jersey & Seashore.....	359	2,759,948	5,672,128	8,980,768	1,843,596	1,576,068	78,777	4,242,456	194,306	7,986,014	88.92	994,754	411,207	580,606	-662,939
Western Pacific	1,011	7,766,161	1,233,623	9,414,199	1,548,770	1,276,131	160,856	3,000,862	221,725	6,333,734	67.27	3,080,464	457,201	2,621,628	-144,119
Western Ry. of Alabama.....	133	1,133,683	772,408	2,070,807	249,477	424,045	36,719	693,228	64,339	1,434,279	72.15	576,528	70,000	506,442	211,680
Wheeling & Lake Erie.....	511	10,157,069	397,703	11,511,848	1,691,098	2,634,269	73,117	4,593,562	254,285	9,247,598	80.50	2,244,250	530,917	1,712,733	-869,015
Yazoo & Mississippi Valley.....	1,382	13,664,596	3,474,979	17,204,312	2,454,769	3,787,423	157,814	6,592,553	459,556	13,427,095	74.99	4,477,217	625,284	3,849,616	78,267

Traffic News

The Railroad Administration's consolidated ticket office in San Francisco was opened on December 23. It was announced that the office in Los Angeles, California, would also be open on that day.

A total of 713,235 cars of grain have been loaded this year by the railroads under federal control up to December 14, as compared with 552,092 the corresponding period of last year.

The embargo which was placed on the movement of hogs to the Chicago stock yards last week was lifted on December 23, to the extent of permitting a limited number of shipments during the remainder of this week.

Coal loading for the week ending December 7, as reported by the Railroad Administration, amounted to 227,782 cars, as compared with 205,110 during the corresponding week of 1917. The total increase this year up to December 14 is estimated at 546,766 cars.

Fines amounting to \$900 have been imposed on the Cleveland, Cincinnati, Chicago & St. Louis Railway Company in the Federal Court at Indianapolis for violation of the quarantine law in transporting hogs without labeling the cars to show that the animals had been exposed to cholera.

Cash in advance for all freight shipments is to be a rule on the railroads of Canada beginning March 1, next, according to a recent order of the Railway Board; exceptions to be made only in the case of large shippers and receivers of freight. These, by giving bonds, can have three days' credit.

Average passenger receipts in September of all the railroads, as estimated by the Bureau of Railway News and Statistics, Chicago, were 2,520 cents a mile, as compared with 1.966 cents for September, 1917; and freight receipts per ton per mile were 9.29 mills, as compared with 7.22 mills in the same month in 1917; average increase in both cases about 28 per cent.

The western passenger traffic committee, acting on the recommendation of the territorial passenger traffic committee, which has been investigating passenger service generally, has recommended the restoration of the through passenger train on the Chicago, Milwaukee & St. Paul, leaving Chicago for Omaha at 5.30 p. m. In connection with this addition, there will be some changes in local passenger trains.

Maximum prices on coal and zone regulations will not be removed before February 1. The coal operators have been trying to bring about the discontinuance of the zone system in order to broaden their markets. The Fuel Administration has permitted the further shipment of bituminous coal from parts of West Virginia, Maryland and Pennsylvania and into sections of Maryland, the District of Columbia and New England. One order permits the all-rail shipment of bituminous coal on the Baltimore & Ohio, the Western Maryland and the Coal & Coke railroads in West Virginia, Maryland and Pennsylvania to all points in New England. The other provides for the shipment of bituminous coal from all districts of Pennsylvania to Baltimore and vicinity and to the District of Columbia.

Director General's Authority Over
Intra State Rates Challenged

The authority of the director general over intra state rates has been challenged by the Nebraska State Railway Commission in an application filed by it in the state court at Columbus, Neb., for an injunction forbidding the Chicago, Burlington & Quincy to charge more than \$4.50 per car—the Commission's rate—on clay from Kairro Clay Pit, Neb.,

to Columbus. The application ignores the director general entirely and makes the Burlington the only respondent.

Uniformity in Drayage Charges

A uniform basis for the determination of drayage or transfer charges between railroad stations at junction points is recommended in a letter from Edward Chambers, director of the Division of Traffic, which is being distributed among the chairmen of district freight committees and freight traffic officers of all lines in western territory by A. C. Johnson, chairman of the western freight traffic committee, Chicago. The letter was occasioned by the large number of applications for freight rate authority recently received proposing advances in drayage charges.

Mr. Chambers says that no attempt will be made to change the practice of absorption or non-absorption of these charges by the railroads as it exists in different places. He believes, however, that instead of having a separate publication for practically every junction point in the country, these charges could be put on a uniform basis, either throughout the country or at least in each section or territory, and not be dependent on the bargain which some local railroad officer is able to get from some individual drayman. This would save a great amount of printing; and if the charges were fixed on a fair average they would not materially affect the railroads' revenue one way or the other.

Applications for freight rate authority to change such transfer charges should always be submitted by the general freight traffic committee to the regional director for approval before forwarding to Washington—this because these charges are nearly always absorbed by the carrier and therefore represent charges against operating expenses.

The practice of making charges by the hundred pounds or the ton, with a minimum charge per shipment, with special exceptions on pianos, etc., should be discontinued, and all such charges should be published on a basis of a flat rate per 100 lb. This change is recommended because it is not fair to publish a minimum charge per shipment when, as a matter of fact, the drayman does not often haul the single shipment separately. The railroads should take some bitter with the sweet, and it will greatly simplify publication to have a flat rate which will represent a fair average of the railroads' out-of-pocket expense for transfer of all the freight.

In instructions accompanying Mr. Chambers' letter, Mr. Johnson asks traffic officers of individual lines to report, through the chairmen of the district freight committees, as to the feasibility of working out a uniform basis of fixing drayage charges, at the same time supplying full information concerning the arrangements now in force on their lines with respect to the payment of transfer charges and the extent to which these charges are borne by shippers or consignees.

PERU AUTHORIZES RAILWAY EXTENSION.—The Peruvian congress has passed a law authorizing the construction of a railroad from Paita to the Maranon River, with a branch to Ferrenafe and another to Hualgayoc.

SURRENDER OF GERMAN LOCOMOTIVES DELAYED.—The *Lokal Anzeiger*, of Berlin, says it learns from competent sources that Marshal Foch has agreed to postpone the date for the surrender of all German locomotives until February 1. Press despatches state that the delivery of German railway material is being carried out very slowly, but without open objection by the Germans. They tried at first to pass off worn out French railway cars, but the commission which was receiving its material was strict in its examinations and accepted only two or three cars out of every ten.

AIR SERVICE BETWEEN ENGLAND AND AUSTRALIA.—Australian commercial and financial interests are discussing a proposal to connect Australia with London and other parts of the British Empire by commercial airplanes. A company has been formed to finance the survey of an aerial route to London by way of Sydney and Port Said. The possibilities of flying from the commercial point of view are dealt with in a report issued by the Civil Aerial Transport Committee. It is declared that nearly five hours could be saved between London and Paris, one day between London and Turin, twelve days between London and Calcutta and thirteen days between London and Johannesburg South.

Commission and Court News

Interstate Commerce Commission

The commission, at the request of the Railroad Administration, has issued an order promulgating rules for constructing combination rates applicable jointly between points located on the lines of carriers operated by the government and points on or reached by way of the lines of carriers not under federal control. These rules provide that where no published through rates are in effect from point of origin to destination on a commodity specified in the order and two or more commodity rate factors are used in arriving at the through rate for a continuous rail shipment, the through rate will be arrived at in the following manner: Each separately established commodity rate factor will be reduced by the amount of a commodity differential shown in a table in the order, and the reduced commodity rate factors will then be added together and the commodity differential will be added to the sum of the separately established commodity rate factors thus obtained.

State Commissions

The advanced rates for merchandise announced by the American Railway Express Company, to go into effect January 1, have been the subject of a conference of the State Railroad Commissions of Iowa, Nebraska and South Dakota; and the Nebraska Commission is to hold a public hearing on December 30 in connection with a tariff for intrastate express traffic which the commission has prepared. If the intrastate rates here proposed are not accepted by the express company, the commission proposes to proceed in the courts for the enforcement of its order.

Personnel of Commissions

Lee Dennis has been appointed a member of the Montana Railroad and Public Service Commission, effective January 1, to succeed J. R. Hall.

Frank Milholland has been appointed a member of the Board of Railroad Commissioners of North Dakota, effective January 1, to succeed M. P. Johnson.

James H. Wilkerson, of Chicago, formerly United States district attorney, has been appointed a member of the Public Utilities Commission of Illinois to fill the vacancy created by the resignation of Fred E. Sterling, state treasurer elect.

Joseph B. Eastman, member of the Massachusetts Public Service Commission and chairman of the Special War Committee of the Association of Railway and Public Utility Commissioners, was nominated by the President last week for appointment as a member of the Interstate Commerce Commission, succeeding George W. Anderson, of Massachusetts, resigned.

Court News

Icing of Perishable Freight

The consignee of a carload of fish agreed with the initial carrier to re-ice the car, and appointed an ice company its agent for that purpose. The ice company's driver reached the carrier's yard too late, after it had been closed. After attempting to communicate by telephone with the carrier's officers, and getting no response, the ice company's foreman abandoned all further efforts to re-ice the car. The Massachusetts Supreme Judicial Court holds that the carrier was not liable for damage to the car of fish on the theory that the refusal of its gateman to permit the ice wagon to enter the yard was negligence on its part. There was no evidence that delivery of the ice was to be made except in accordance with the general regulations of the carrier for the transaction of business at the yard.—*Emery v. Boston & Maine (Mass.), 120 N. E., 106.* Decided May 24, 1918.

Equipment and Supplies

Locomotive Specialties

While the specialties for the recent orders for 600 locomotives placed by the Railroad Administration have not yet been definitely decided, the Central Advisory Purchasing Committee has given the locomotive builders information as to some of the principal specialties authorized for a part of the order. These include the stokers, air brakes, valve gear, safety valves, throttle valves, draft gear yokes, radial buffers, bolsters and side frames, driving box lubricators, grate shakers and fire doors. Although the full quantities have not been fully settled some of the air brakes will be furnished by the Westinghouse Air Brake Company and the New York Air Brake Company. The valve gear will be of the Wal-schaert and Baker types. Radial buffers, driving box lubricators and grate shakers will be ordered from the Franklin Railway Supply Company. Part of the side frames will be ordered from the Buckeye Steel Castings Company and part of the fire doors from the National Railway Devices Company. The lubricators will be of the Nathan and Detroit types.

Locomotive Deliveries

A total of 62 new locomotives were shipped to railroads under federal control during the week ending December 14, of which 48 were of the U. S. R. A. standard types, as follows:

Works	Road	Number	Type
American	N. Y. C.	17	USRA Mikado
	Southern	9	USRA Santa Fe
	Southern	3	USRA 8-W. Switch
	*C. & N. W.	8	Mikado
	T. of St. L.	4	USRA 6-W. Switch
	P. L. W.	2	USRA 6-W. Switch
	Long I.	2	8-W. Switch
	C. & O.	1	USRA Mountain
	Total	46	
Lima	N. Y. C.	7	USRA Mikado
Baldwin	C. G. W.	1	USRA Mikado
	Southern	1	Mallet
	C. B. & Q.	1	Mikado
	W. Pac.	4	USRA Mikado
	Penn. R. R.	1	Mikado
	A. T. & S. F.	1	Mikado
	Total	9	
	Grand total	62	

*Sixteen USRA Mikados constructed for the New York Central were sent to Buffalo, N. Y., and two Chicago & Northwestern Mikados were shipped to Potomac Yards, Va., to be stored as parts of emergency pools.

Locomotive Deliveries in November Total 203

The Railroad Administration has issued the following statement of locomotives shipped to railroads under federal control for the month of November, making a total of 203:

Works	For week November 1 to 2			For week November 3 to 7			For week November 10 to 16			For week November 17 to 23			For week November 24 to 30			
	Road	No.	Type	Road	No.	Type	Road	No.	Type	Road	No.	Type	Road	No.	Type	
American	Sou.	4	USRA Mik.	Sou.	10	USRA Mik.	Mich.C.	14	USRA Mik.	Wabash	17	USRA Mik.	N.C.&St.L.	6	USRA Mik.	
	Erie	3	USRA Mik.	N.Y.C.	10	USRA 8wSw.	N.Y.C.	8	USRA 8wSw.	P.L.W.	3	USRA 6wSw.	P.L.W.	2	USRA 6wSw.	
	N.Y.C.	2	USRA 8wSw.	Erie	2	USRA Mik.	Erie	1	USRA Mik.	P.L.W.	1	Santa Fe	C.ofN.J.	3	USRA 6wSw.	
	C.&N.W.	1	Mikado	W.&L.E.	2	USRA 8wSw.	Wabash	3	USRA Mik.	C.ofN.J.	4	USRA 6wSw.	N.Y.C.	14	USRA Mik.	
	A.C.L.	1	USRA 6wSw.	Mich.C.	6	USRA Mik.	E.P.&S.W.	1	USRA Mik.	H.V.	2	Mallet	N.Y.C.	1	USRA 8wSw.	
	H.V.	1	Mallet	A.C.L.	2	USRA 6wSw.	P.L.W.	2	USRA 8wSw.	E.P.&S.W.	3	USRA Mik.	Sou.	6	USRA 8wSw.	
		12		Rut.	1	USRA 8wSw.	C.ofN.J.	2	USRA 8wSw.	N.C.&St.L.	4	USRA Mik.	C.&N.W.	5	Mikado	
				C.ofN.J.	1	USRA 6wSw.	Vgn.	1	Mallet	N.Y.C.	2	USRA 8wSw.	H.V.	1	Mallet	
							H.V.	1	Mallet	Sou.	3	USRA 8wSw.	P.L.W.	1	Santa Fe	
								34		33		39		43		
	Lima	III.Cent.	1	Mikado	N.Y.C.	4	Mohawk	N.Y.C.	1	Mohawk	N.Y.C.	5	USRA Mik.	N.Y.C.	6	USRA Mik.
	Baldwin	C.C.C.&St.L.	1	USRA Mik.	C.C.C.&St.L.	3	USRA Mik.	Sou.	1	Mallet	C.C.C.&St.L.	6	USRA Mik.	C.C.C.&St.L.	3	USRA Mik.
				A.T.&S.F.	1	Mikado	C.C.C.&St.L.	1	USRA Mik.	A.C.L.	1	Mikado	C.G.W.	4	USRA Mik.	
										G.N.	1	Mikado	G.N.	1	Mikado	
															8	
															57	
															203	

Supply Trade News

The records in the offices of the mechanical department of the El Paso & Southwestern, at El Paso, Texas, were lost in a fire on December 5. F. B. Lister has requested the Supply Trade to send catalogs to replace those destroyed.

John Sterling Deans, vice-president and consulting engineer of the Phoenix Bridge Company, died at his home in Phoenixville, Pa., on December 16. Mr. Deans was appointed chief engineer of the company in 1892. Among the more important structures which he built are the elevated railways of New York City and the Pecos River viaduct on the Southern Pacific.

Major William L. Allison, who for the past 18 months has been in active military service, has been honorably discharged from the U. S. Army and has resumed his duties as vice-

president of the American Arch Company. In addition, Major Allison has been elected vice-president in charge of sales of the Locomotive Feed Water Heater Company. Major Allison was born near Salisbury, N. C. He graduated from the Davis Military School of Winston-Salem, N. C. For over three years he was in government service as deputy marshal. For six years he was employed in various capacities in the Baldwin Locomotive Works, Philadelphia, and in January, 1904, he became mechanical engineer of the Atchison, Topeka & Santa Fe. He resigned from the Santa Fe to become mechanical engineer of the Franklin Railway Supply Company. He was later western sales manager of that company, the Rome Merchant Iron Mills, the Economy Devices Corporation, and general western sales manager of the American Arch Company. He became vice-president of the latter company in January, 1914, which position he still holds in addition to the vice-presidency of the Locomotive Feed Water Heater Company.



Major Allison

Railway Officers

Railroad Administration

Regional

J. B. Chandler, office manager for the Northwestern regional director, has been promoted to office assistant, with headquarters at Chicago.

C. E. Chambers, superintendent of motive power of the Central of New Jersey, has been appointed mechanical assistant to **Charles H. Markham**, regional director of the Allegheny region of the United States Railroad Administration, with headquarters at Philadelphia, Pa., succeeding **J. T. Carroll**, resigned to go to the Baltimore & Ohio.

Operating

P. G. Walton, division superintendent of the North Carolina division of the Seaboard Air Line, has been appointed general superintendent of the northern district, with headquarters at Hamlet, N. C., vice **W. R. Hudson**, resigned to accept service with another line.

Engineering and Rolling Stock

W. J. Eck has been appointed signal and Electrical superintendent of the Southern Railroad Lines and associated railroads, with headquarters at Washington, D. C.

R. E. Weedon has been appointed superintendent of the Charlotte roadway shop of the Southern Railroad, with headquarters at Charlotte, N. C.

Charles N. Bainbridge, whose appointment as engineer of design of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, was announced in the *Railway Age* for December 13, was born at Philadelphia, Pa., on March 29, 1887. He received the degree of B.S. in civil engineering from the Pennsylvania State College in 1907, and the degree of C.E. in 1910. He began railway work in June, 1909, with the Chicago, Milwaukee & St. Paul. During September of that year he was instructor in civil engineering at the Pennsylvania State College, returning to the Chicago, Milwaukee & St. Paul in October. He remained with that road for two years as designer of steel and reinforced concrete structures. He also was engaged on studies for grade separation work during that period. From November, 1911, to March, 1912, he was with the Baltimore & Ohio at Baltimore, Md., as designer of steel railway bridges, largely in connection with grade separation work. Mr. Bainbridge then returned to the engineering department of the St. Paul, and for two years was squad foreman in charge of detail and design of miscellaneous structures and grade separation studies. The following four and one-half years he was office engineer in charge of detail, design and estimating of miscellaneous structures; and of design and special studies for grade separation problems in Minneapolis, Minn.; Milwaukee, Wis.; Chicago, and Evanston, Ill., involving an expenditure of approximately \$12,000,000. For four months previous to his recent appointment as engineer of design he was assistant engineer, in charge of the erection and maintenance of steel and timber bridges.

Corporate

Executive, Financial, Legal and Accounting

Robert C. Vaughan, whose appointment as assistant to president of the Canadian Northern and the Canadian Government Railways, with headquarters at Toronto, Ont., has already been announced in these columns, was born on December 1, 1883, at Toronto. He began railway work with the Canadian Pacific and four years later entered the service of the Grand Trunk. He remained with that road for one

year and then served in various capacities for 16 years on the Canadian Northern, until his recent appointment as assistant to president of the same road and the Canadian Government Railways, as above noted.

Jerry Welch, whose appointment as controller of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been announced in these columns, was born at Lawler, Iowa, on August 13, 1874. He began railway work in 1890 with the Sioux City & Northern and was employed in a clerical capacity until 1900. The following four years he was agent for the Union Terminal Railway and the Great Northern, and from 1904 to 1910 was successively traveling auditor and auditor for the Montana Railroad. Mr. Welch then became auditor for the Chicago, Milwaukee & St. Paul, and in 1913 he was promoted to assistant general auditor. On January 1, last, he became assistant federal auditor, which position he held at the time of his recent appointment as controller for the corporation.

Engineering and Rolling Stock

Major F. L. C. Bond, whose appointment as chief engineer of the Grand Trunk Railway System, with headquarters at Montreal, Que., was announced in our issue of last week, has just returned from overseas after two years' service with the Tenth Battalion, Canadian Railway Troops.



Major Bond

He was born on February 21, 1877, at Montreal, Que., and was educated in the high schools of his native town; also at Collegiate Institute and at McGill University. In 1898 he entered the service of the Grand Trunk as eastern resident engineer of the Eastern division of the Grand Trunk, and in 1901 was appointed engineer in charge of double track construction. The following year he went to New York city and was appointed night superintendent on the construction of the Park avenue tunnel of the subway. He subsequently returned to the service of the Grand Trunk as resident engineer, Eastern division, remaining in that position until 1913. He then served as division engineer, Eastern lines, until 1916, when he went overseas with the Canadian Expeditionary Forces, and now becomes chief engineer of the Grand Trunk as above noted.

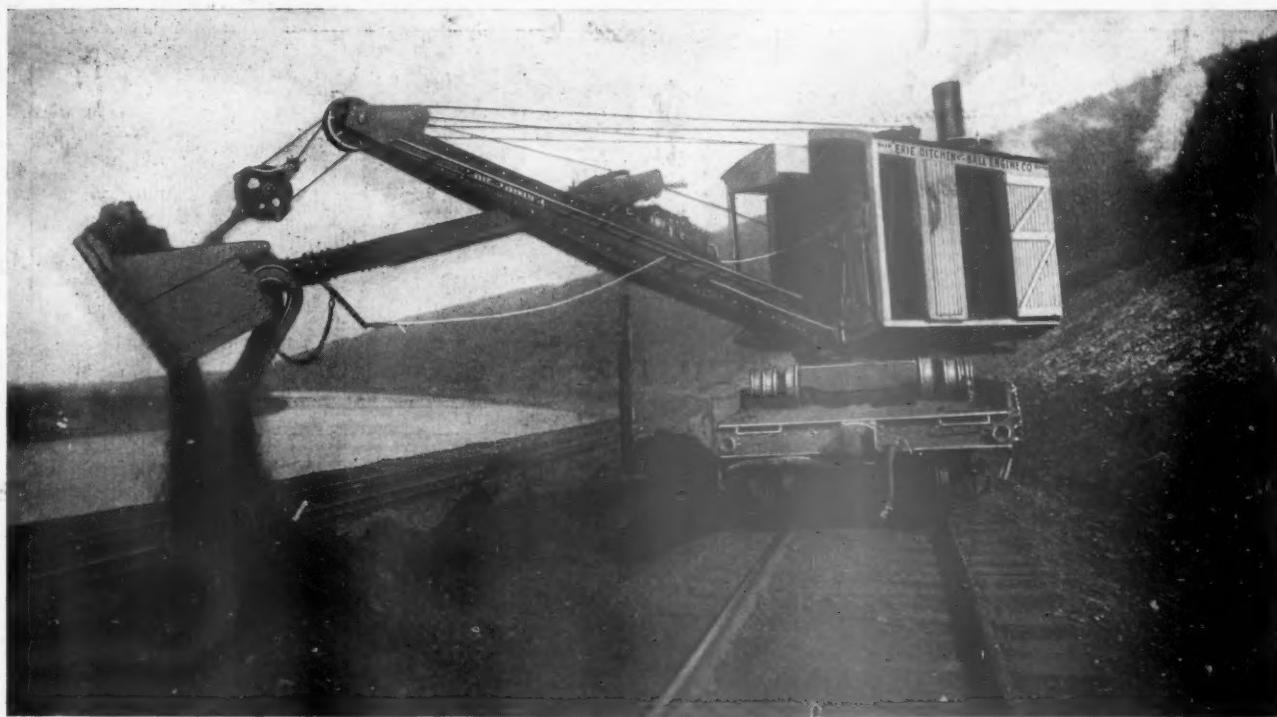
Operating

J. P. Driscoll, superintendent of car service of the Canadian Northern Railway System, at Winnipeg, Man., has been appointed general superintendent of car service of the Canadian Northern Railway System, and the Canadian Government Railways, with jurisdiction over all lines, and headquarters at Toronto, Ont.

Obituary

J. B. Keefe, formerly assistant general freight agent of the Delaware, Lackawanna & Western, with office at New York, died recently at his home in Orange, N. J.

T. W. Heintzelman, formerly general superintendent of motive power of the Southern Pacific, died in San Francisco, Cal., on December 11. Mr. Heintzelman, after serving the Southern Pacific in various capacities for about 28 years, retired on January 1, 1917, on account of ill health. A few days prior to his death he contracted a severe cold which developed into pneumonia.



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You can depend upon this improved ditcher

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The ERIE Ditcher is an all-around labor saver, handling every kind of ditching machine work and locomotive crane service too.

It is very quick-acting, and the control is extremely simple.

The ERIE Ditcher is being used by progressive roads such as the "Pennsylvania," C. B. & Q., L. & N., C. P. R., etc., etc.

We would like to send you a bulletin describing the ERIE Ditcher and its work. Write for a copy of Bulletin L.



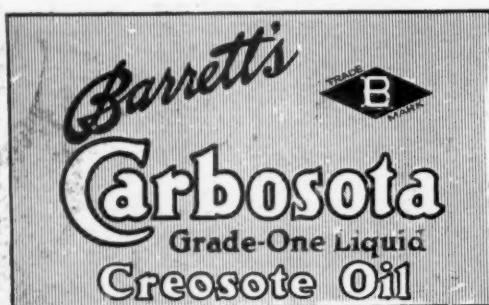
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"The Unpardonable Sin"

"The unpardonable sin of the business world of the future will be—waste."

"Waste of material or labor—of time or of money—and only less heinous in degree than the sin of commission will be the sin of omission."

These quotations are extracted from an excellent editorial of the same title appearing in the October 15th issue of "The Gulf Coast Lumberman." They are equally applicable to the waste that results from failure of protecting structural wood against decay.

The "Sin of Omission" is neglecting to become informed regarding the practice of wood preservation and the potential economy of its application.

The "Sin of Commission" is wilful disregard of the factor of durability—the attitude of "taking a chance"; the erection of timber structures where influences favorable to decay are known to exist, without employment of remedial measures.

(Green wood cannot be effectively creosoted by non-pressure processes. It should be air-dry. In regions of moist, warm climate, wood of some species may start to decay before it can be air-dried. Exception should be made in such cases, and treatment modified accordingly.)



Brush-treating faying surfaces of ship timbers with Carbosota.



Spraying: Applying Carbosota to ends, mortises, and tenons (points of contact) of caps and stringers for trestle.

Preservation of structural wood from decay is essentially a conservation measure, and therefore beneficial to the entire nation.

Non-pressure processes—i. e. the Open Tank Process and Surface Treatments, such as brush applications, spraying or dipping, are particularly adaptable to the conditions of average consumers and are practical as well as efficient.

Full information, specifications, etc., and an analysis of any particular case by experts may be obtained gratis by addressing nearest office.

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The Open-Tank Process: Simple wooden tank (lined with sheet iron) equipped with steam-coils and small derrick. Upon completion of the hot treatment, both oil and timber are permitted to cool instead of being transferred to a cold tank.

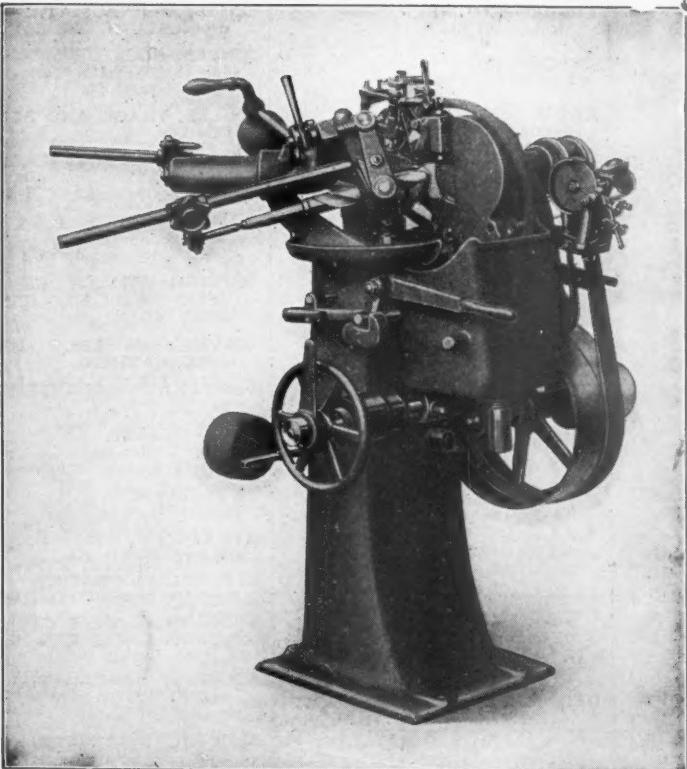
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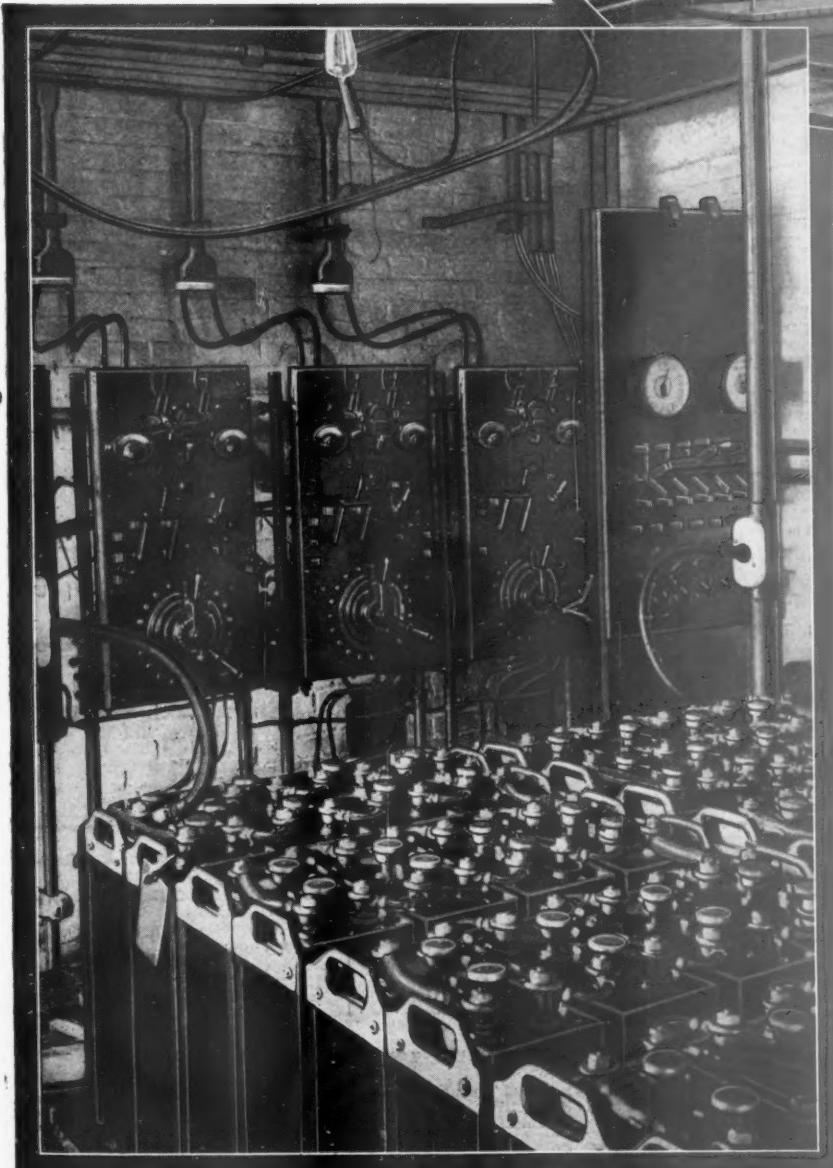
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General Electric Co. Gould Coupler Co.	PACKING.
Safety Car Heating & Lighting Co. Westinghouse Elec. & Mfg. Co.	American Balance Valve Co. Goodrich Rubber Co., B. F.
LIGHTING, CAR, GAS.	Hunt-Spiller Mfg. Corp.
Safety Car Heating & Lighting Co.	Johns-Manville Co., H. W.
LIQUID FUEL FURNACES — (SEE FURNACES, LIQUID FUEL).	Paxton-Mitchell Co.
LOCKERS AND SHELVING (STEEL FIREPROOF).	Power Specialty Co.
Edwards Mfg. Co.	Q & C Co.
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Camel Company.	PACKING, LOCOMOTIVE PISTON ROD.
LOCOMOTIVE CRADLE, CAST STEEL.	Q & C Co.
Commonwealth Steel Co.	PACKING, METALLIC.
LOCOMOTIVE CRANES.	Paxton-Mitchell Co.
Ball Engine Co.	PAINT SPRAYS — (SEE SPRAYING EQUIPMENT, PAINT).
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Birmingham Rail & Locomotive Co. Gray & Son, Inc.	Barrett Co., The. Dixon Crucible Co., Joseph. Lehov Company.
LOCOMOTIVE HEADLIGHTS — (SEE HEADLIGHTS).	National Railway Appliance Co. Sherwin-Williams Co. Wadsworth-Howland Co.
LOCOMOTIVES, SECOND HAND.	PAINTS, COLD WATER.
Southern Iron & Equipment Co.	Johns-Manville Co., H. W.
LOCOMOTIVE SMOKE JACKS — (SEE SMOKE JACKS).	PAINTS, GRAPHITE.
LOCOMOTIVE SYPHONS.	U. S. Graphite Co.
Western Ry. Equipment Co.	PAINTS, INSULATING.
LOCOMOTIVE TIRES — (SEE TIRES, STEEL).	Lehov Company. Sherwin-Williams Co.
LOCOMOTIVE TRACK SANDERS — (SEE SANDERS).	PAINTS, LOCOMOTIVE.
The Pyle-National Co.	Barrett Co. Sherwin-Williams Co.
LOCOMOTIVES, COMPRESSED AIR.	PAINTS, METALLIC.
Baldwin Locomotive Works, The. Porter Co., H. K.	Barrett Co. Dixon Crucible Co., Joseph. Sherwin-Williams Co. Wadsworth-Howland Co.
MINING MACHINERY.	PAINTS, PRESERVATIVE.
BUcyrus Co.	Barrett Co., The. Sherwin-Williams Co.
General Electric Co.	PAINTS, WOOD PRESERVATIVE.
Lima Locomotive Works, Inc.	Carboileneum Wood Preserving Co.
Midvale Steel & Ordnance Co.	PAVEMENT FILLER.
Fuller-Lehigh Co.	Barrett Co., The.
PAVING BLOCKS, WOOD, CREOSOTED.	PAVING BLOCKS, WOOD, CREOSOTED.
Barrett Co., The.	Barrett Co., The.
PLOWS, SNOW, Q & C Co.	PLOWS, LOCOMOTIVE AND RAILROAD.
PLUGS, STEAM, CHEST, OIL.	Western Wheeled Scraper Co.
Franklin Ry. Supply Co., Inc.	POLES, BUTT TREATED.
PLUMBAGO.	Kirby-Bonner Lumber Co.
U. S. Graphite Co.	CHASE & CO., L. C.
PLUSH, MOHAIR.	Chicago Pneumatic Tool Co. Independent Pneumatic Tool Co. Ingersoll-Rand Co.
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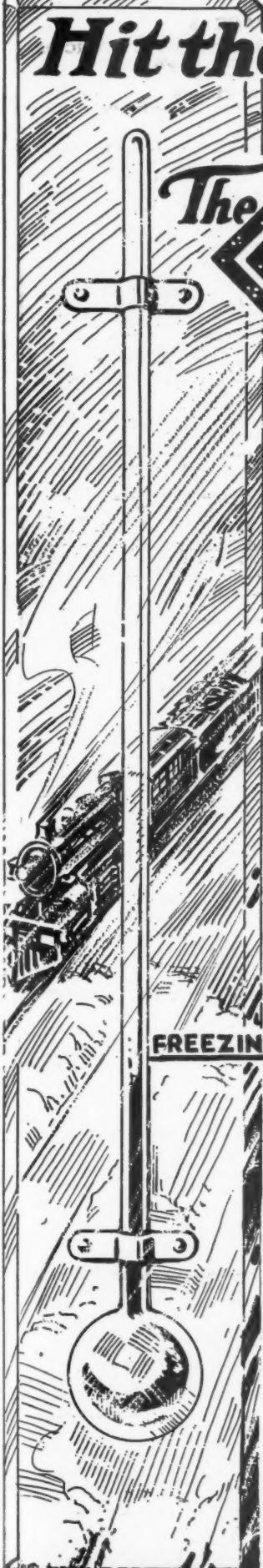
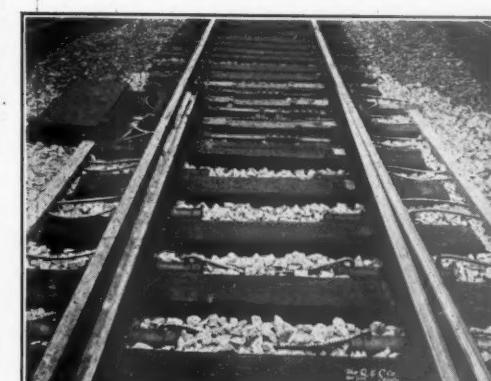
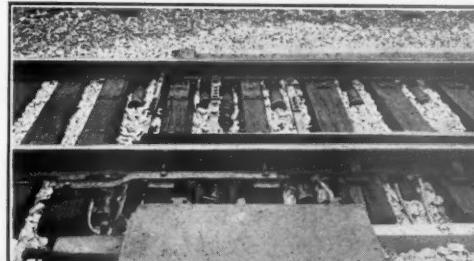
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Canton Fdry. & Machine Co.		National Tube Co.	Pittsburgh Forge & Iron Co.
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Union Switch & Signal Co.		SHAFITING, HOLLOW.	Fort Pitt Spring & Mfg. Co.
POWER HAMMERS—(SEE HAMMERS, POWER).		Fails Hollow Staybolt Co.	Pittsburgh Spring & Steel Co.
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PRESERVATIVES, BELT—(SEE BELT PRESERVATIVE).		SHAFITING, HOLLOW.	Standard Steel Works Co.
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PRESSURE, REGULATING.		Tyler Tube & Pipe Co.	SPRINGS, VANADIUM.
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PULVERIZER MILLS.	Fuller-Lehigh Co.	National Tube Co.	STANDPIPES—(SEE WATER COLUMNS).
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PUMPS AND PUMPING MACHINERY.	Boston & Lockport Block Co.	National Tube Co.	STAYBOLTS.
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Q & C Co.		National Tube Co.	Lukens Steel Co.
RAIL FASTENINGS.	P. & M. Co., The.	SHAFITING, HOLLOW.	STEEL, SHEET PILING—(SEE PILING, STEEL SHEET).
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		SHAFITING, HOLLOW.	General Railway Signal Co.
		National Tube Co.	Hall Switch & Signal Co.
		SHAFITING, HOLLOW.	P. & M. Co., The.
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Melting snow causes a slight mist which prevents an accumulation of snow. Keeps the switch mechanism free for operation. Eliminates labor expense and DANGER to men cleaning switches during a blinding snow storm. The heat provides a natural drainage.

A modern invention which must be considered by every modern Railroad as a simple, durable and fool proof safety device.

Write or wire for price, stating current available.

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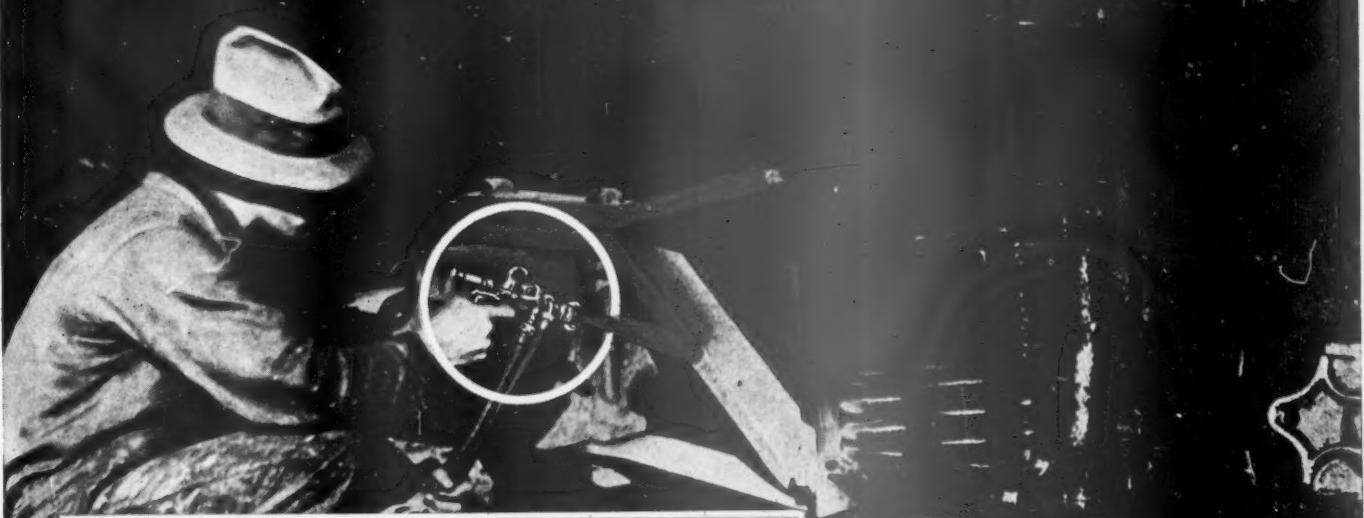
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TANKS.	Air Reduction Sales Co.	Commonwealth Steel Co.	Page Steel & Wire Co.
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Kolesch & Co.	TRACK DRILLS—(SEE DRILLS, TRACK).	VALVES, DRIFTING.	American Locomotive Co.
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Buda Co.	TURPENTINE.	WATER TREATMENT.	
Fairbanks, Morse & Co.	Kirby-Bonner Lumber Co.	Dearborn Chemical Co.	
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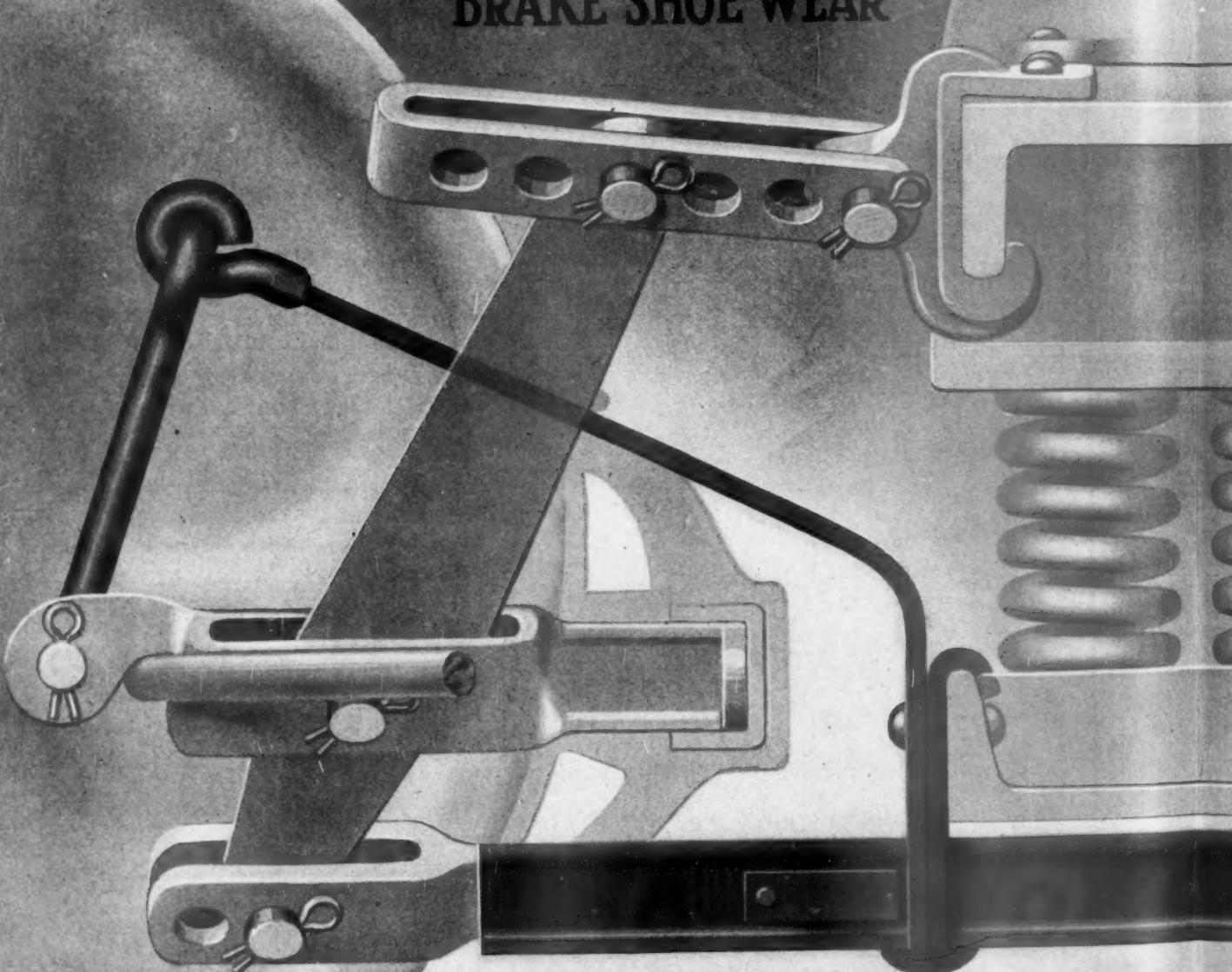
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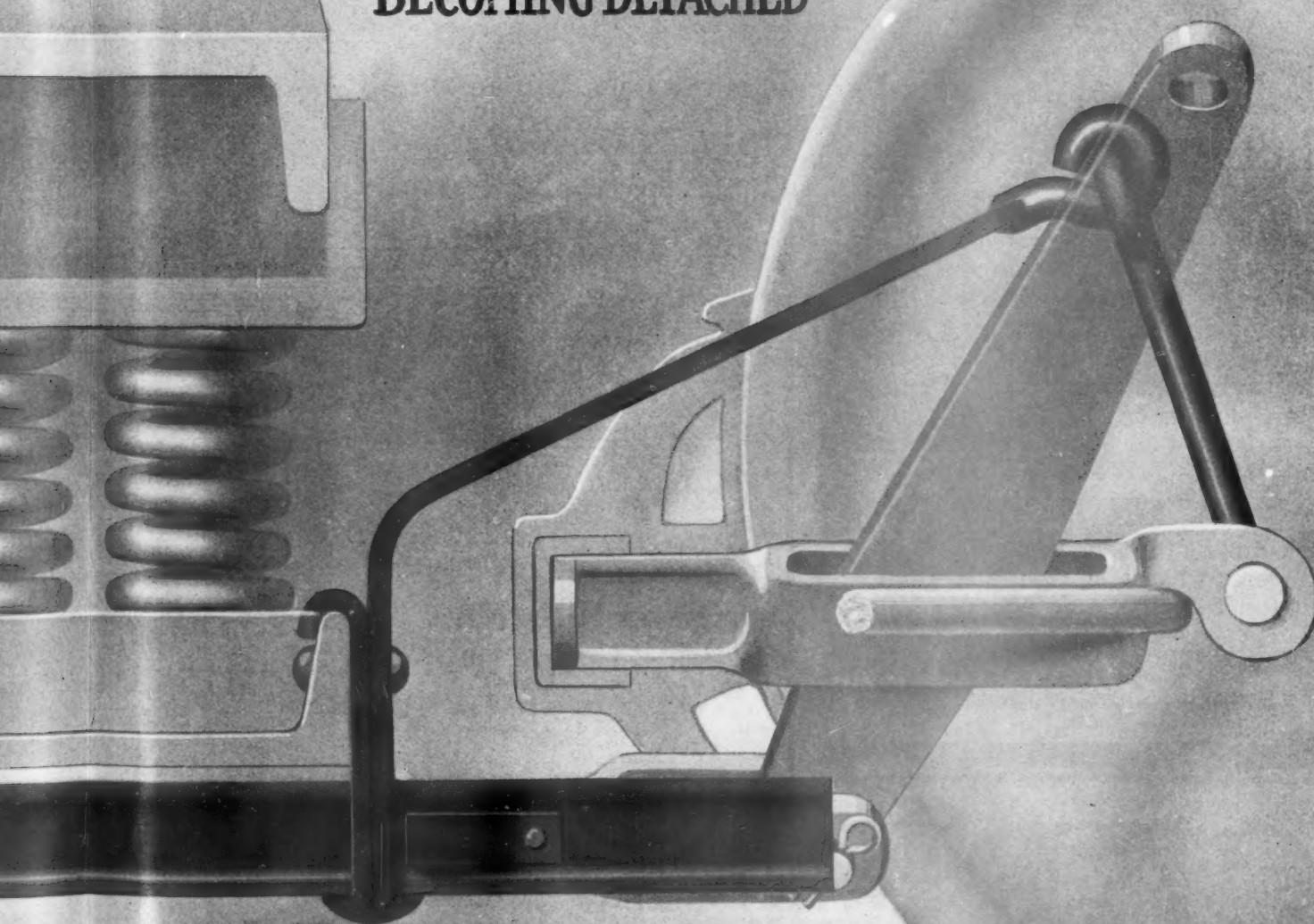
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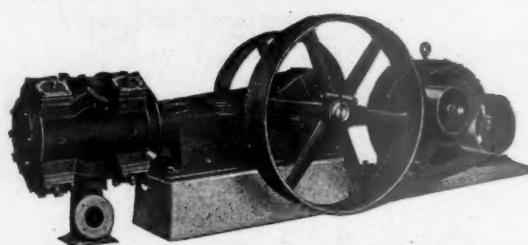
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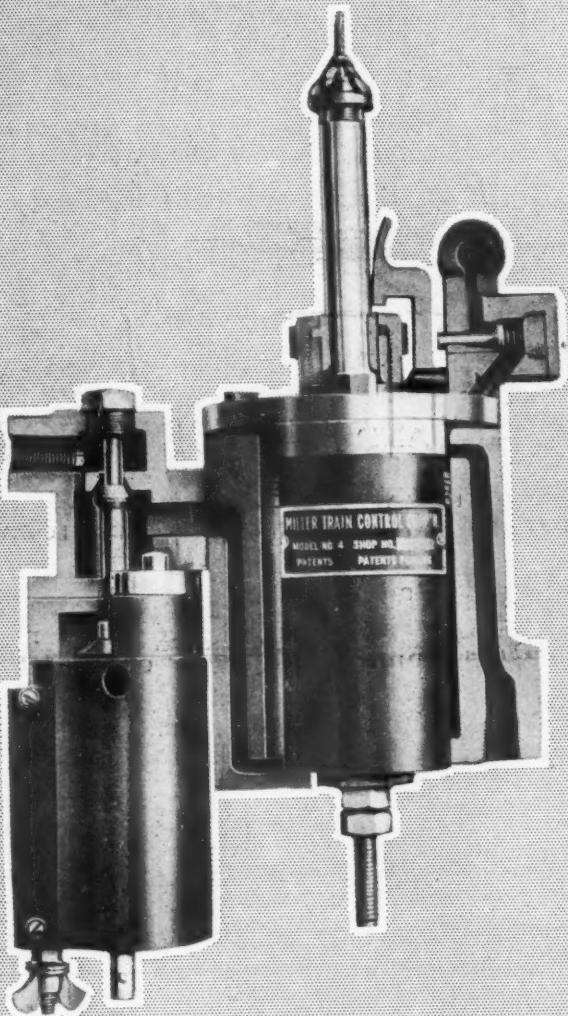
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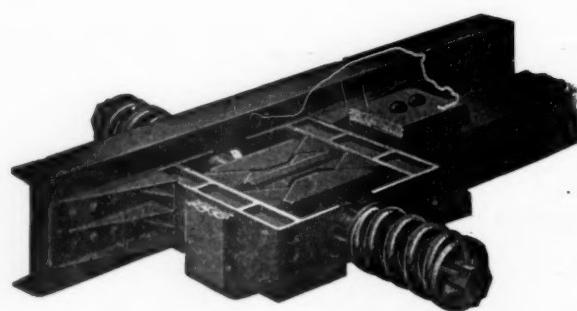
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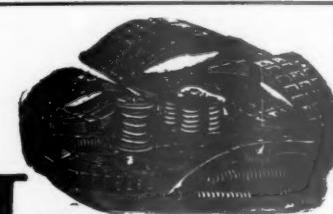
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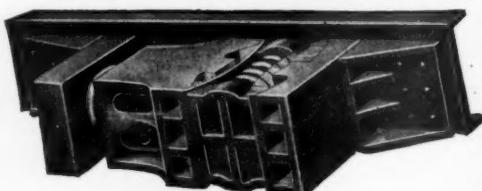
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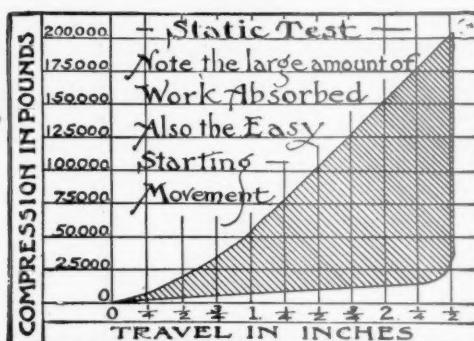


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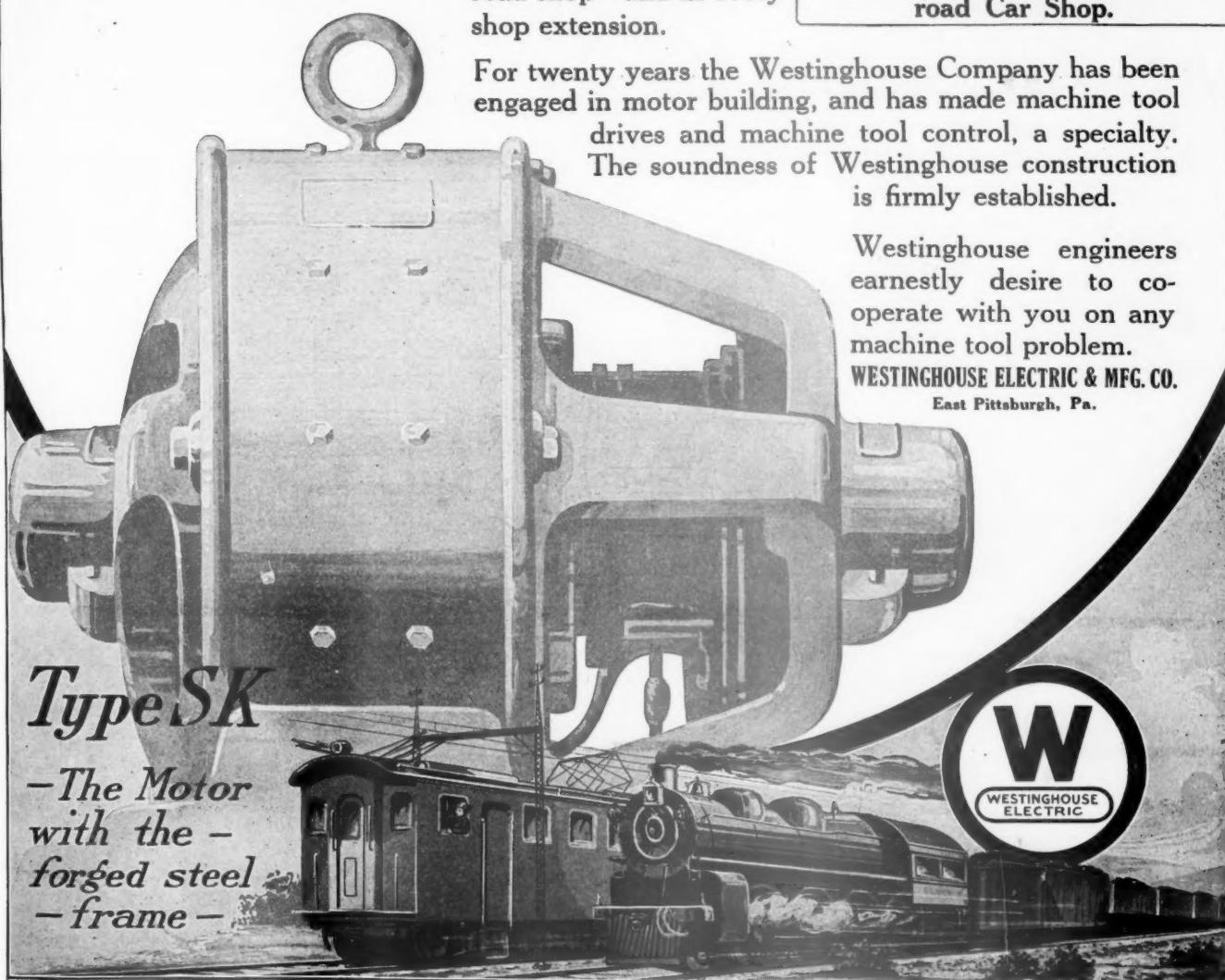
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Railway Age

Quality of Feed Water and Quantity Consumed

Influence of Amount of Daily Consumption Upon the Determination of the Question of the Economy of Water Treatment

(Second Article)

By W. R. Toppin

Manager, Railroad Department, Wm. Graver Tank Works

In the previous article upon this subject it was stated that even in cases where waters are not high in scale-forming matter, yet the daily consumption may be so great as to more than justify treatment for the reduction of the incrusting solids to four or less grains per gallon. It was shown that this statement may be clearly demonstrated by taking the amount of incrusting solids that may be removed, or prevented from entering the boilers, calculating the results with reference to certain effects upon locomotive boilers of such prevention or removal and reducing to dollars and cents upon bases recognized by authorities as approximately accurate.

A concrete example is afforded by the results of certain investigations recently made upon one division of a large railway system. The supply of water at one station upon analysis was found to contain 15.37 grains of incrustants per gallon, and the consumption of water for locomotives amounted to 598,600,000 gallons annually, or 1,640,000 gallons per day. By the installation of a suitable treating plant the amount of incrusting solids could be reduced to 4.0 grains per gallon. This would amount to the removal of 1,625 pounds of incrustants per thousand gallons, or 972,725 pounds of incrustants per year.

For the accomplishment of this result there was recommended the installation of a water-softening plant having a capacity of 75,000 gallons per hour. This would mean a main settling tank of much greater capacity than is ordinarily required in railway installations.

Upon the basis of cost of a plant of this capacity, including liberal estimates of the cost of foundation, housing, piping, pump, etc., and calculating operating expenses—reagents, attendance, maintenance, interest and depreciation—it appeared that annual savings equivalent to 264 per cent of the cost of the plant would be a reasonable expectation of the results of installing an adequate treating plant.

A statement of a claim of so great a percentage of saving requires an explanation of the basis on which the conclusion was reached. It is not necessary to enter into details of the exact cost of the plant nor of the basis upon which the calculations as to the cost of operation were made. They have been estimated upon the same elements which have entered into similar calculations which have been made during many years, with proper allowance for changed conditions in the cost of labor and materials. It should be added, also, that the estimated cost of the plant was unusually high in proportion to capacity, for the reason that the location of the station was such as to require the tank to be placed exceptionally high from the level of the base of the rail.

The standard of saving per pound of incrustants removable was taken at ten cents. In Bulletin No. 163 of the American Railway Engineering Association, in which con-

sideration was given this subject, a unit saving of seven cents per pound of incrustants removed was determined upon as a reasonable figure under then existing market and traffic conditions. A complete explanation is given in that bulletin of the process by which the result was reached, and the basis of calculation was plainly conservative for that date. But owing to existing market and traffic conditions it is believed to be equally conservative at this time to raise this unit to ten cents instead of seven cents. This is the factor now in use by most railway officials.

Upon the previously stated basis of 972,725 pounds of incrustants removable in one year by the installation of a suitable water-treating plant, at the rate of ten cents per pound the gross saving would be \$97,273.

Deducting from this the operating cost for one year, including interest, depreciation and maintenance, there is left a net saving per year of 264 per cent, as stated. This is the estimated percentage of annual net saving resulting from the treatment of water having only slightly in excess of 15 grains of incrustants per gallon, but at a station where the importance of treatment is magnified by the large daily consumption of 1,640,000 gallons.

Similar estimates were made upon nine other stations upon the same division, following a thorough investigation, including, in addition to chemical analysis, a study of the amount of annual and daily consumption of water and of the operating conditions of the division.

The following are typical examples of the results of these investigations:

Station A.—Consumption, 206,061,360 gallons per year, or 701,264 gallons per day; incrustants, 16.35 grains per gallon, of which 1.76 pounds can be removed per 1,000 gallons, or 450,670 pounds per year. At a standard saving of ten cents per pound of incrustants removed, the net saving per year is equivalent to 230 per cent upon the estimated cost of plant.

Station B.—Consumption, 135,050,000 gallons per year, or 370,000 gallons per day; incrustants, 11.086 grains per gallon, of which 1.01 pounds can be removed per 1,000 gallons, or 136,400 pounds per year. At a standard saving of ten cents per pound of incrustants removed, the net saving per year is equivalent to 66 per cent upon the estimated cost of plant.

Station D.—Consumption, 127,020,000 gallons per year, or 348,000 gallons per day; incrustants, 13.48 grains per gallon, of which 1.36 pounds can be removed per 1,000 gallons, or 172,747 pounds per year. At a standard saving of ten cents per pound of incrustants removed, the net saving per year is equivalent to 98 per cent upon the cost of plant.

Stations F and G.—Consumption, 143,262,500 gallons per year, or 392,500 gallons per day; incrustants, 10.572 grains per gallon, of which 0.94 pounds can be removed per 1,000 gallons, or 134,667 pounds per year. At a standard saving of 10 cents per pound of incrustants removed, the net saving per year is equivalent to 53 per cent upon the cost of plant.

A comparison of the estimated cost and estimated saving for the whole division shows that there may be expected a net annual saving of 167 per cent upon the cost of equipment of the division with water-treating plants.

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VAPOR CAR HEATING CO., Inc.

RAILWAY EXCHANGE, CHICAGO

SUCCESSOR TO

CHICAGO CAR HEATING CO. — STANDARD HEAT & VENTILATION CO., Inc.
 CHICAGO NEW YORK BOSTON WASHINGTON ATLANTA MONTREAL

Damascus Bronze Company Pittsburgh

Unconditionally guaranteed to give 50 per cent.
greater mileage and not to heat or cut the axle or pin
DAMASCUS NICKEL BRONZE
THE UNEXCELLED RAILROAD ALLOY
Quotations and complete information on request

AXLES

FOR PASSENGER OR FREIGHT
CARS AND LOCOMOTIVES*"Pollak"* Special Heat Treated
Steel. Open Hearth—Nickel
or Vanadium Steel

THE POLLAK STEEL CO.

FORGINGS

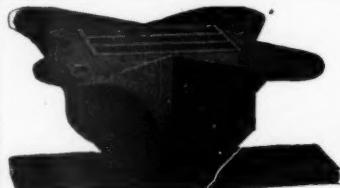
MARINE MACHINE AND
ENGINEFrom 10 lbs. to 100,000 lbs. each
of every shape and
Description

Cincinnati, O.

CAR LIGHTING

THE SAFETY CAR HEATING

AND LIGHTING CO. Chicago
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Roller Center
and
Side Bearings

EDWIN S. WOODS & CO.
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Cast Iron Smoke Jacks
Light Fire-Proof Smoke Jacks
Ventilators All Materials
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Cast Iron Buildings
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PAUL DICKINSON, Inc., 3354 South Artesian Ave., Chicago

MALLEABLE IRON CASTINGS

ANNUAL CAPACITY, 25,000 TONS

FORT PITT MALLEABLE IRON CO., Pittsburgh, Pa.

RAILWAY UTILITY COMPANY

Sole Manufacturers

"Honeycomb" and "Round Jet" Ventilators
For Monitor and Arch Roof Cars, and all classes of buildings; also
"Electric Thermometer Control"

of Car Temperatures.
141 to 151 W. 22nd St. Write for 1328 BROADWAY
Chicago, Ill. Catalogue New York, N. Y.



RAILWAY LINE

"SHORTEST ROUTE TO BEST RESULTS"
A PRODUCT FOR EVERY RAILWAY USE

THE SHERWIN-WILLIAMS CO.

CLEVELAND, OHIO

FORT PITT SPRING AND MANUFACTURING CO.

PITTSBURGH, PA.
Manufacturers of
COIL AND ELLIPTIC SPRINGS
VANADIUM
STEEL
SPRINGS



TIE PLATES

Send for Catalogue

MANUFACTURED FROM NEW STEEL BILLETS
WORKMANSHIP AND MATERIAL GUARANTEED

THE RAILROAD SUPPLY COMPANY
BEDFORD BUILDING, CHICAGO

Cast Steel

Buckeye Truck Frames, Truck Bolsters, Body Bolsters, Draft Yokes, "D" Couplers, Major Couplers, Coupler Repair Parts in Stock.

The Buckeye Steel Castings Company
Works and Main Office: COLUMBUS, OHIO

New York Office Chicago Office St. Paul, Minn., Office
1274 No. 50 Church St. 619 Railway Exch. Bldg. 817 Merchants Bank Bldg.

BARBER TRUCKS CENTER PLATES AND SIDE BEARINGS

Will relieve Wheel Flange and Coupler Knuckle wear, also end wear on Journal Bearings.

STANDARD CAR TRUCK CO.

McCormick Bldg., Chicago

"STANDARD"

Steel Tires

Steel Tired Wheels

Solid Rolled Steel Wheels

O. H. Steel and Malleable Iron Castings

Solid Forged Gear Blanks

Steel forgings

Iron forgings

Forged and Rolled Steel

Pipe Flanges

Ring Dies

Rings

Roll Shells

Steel Springs



"The 'Standard' Brand on your material
is an assurance of eventual economy."



STANDARD STEEL WORKS CO.

GENERAL OFFICES:

MORRIS BUILDING, PHILADELPHIA, PA.

CHICAGO
ST. LOUIS
HAVANA, CUBA

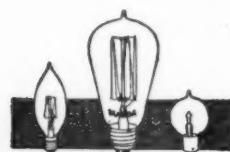
RICHMOND
SAN FRANCISCO
NEW YORK
MONTEREY, MEX.

MEXICO CITY
LONDON, ENGLAND
PARIS, FRANCE



MAZDA

"Not the name of a thing, but the mark of a service"



A MAZDA Lamp for every purpose

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select

scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.



RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

NATIONAL CONSCIOUSNESS

Because of the days—

"When every moment had its deed and
every deed its hero,"

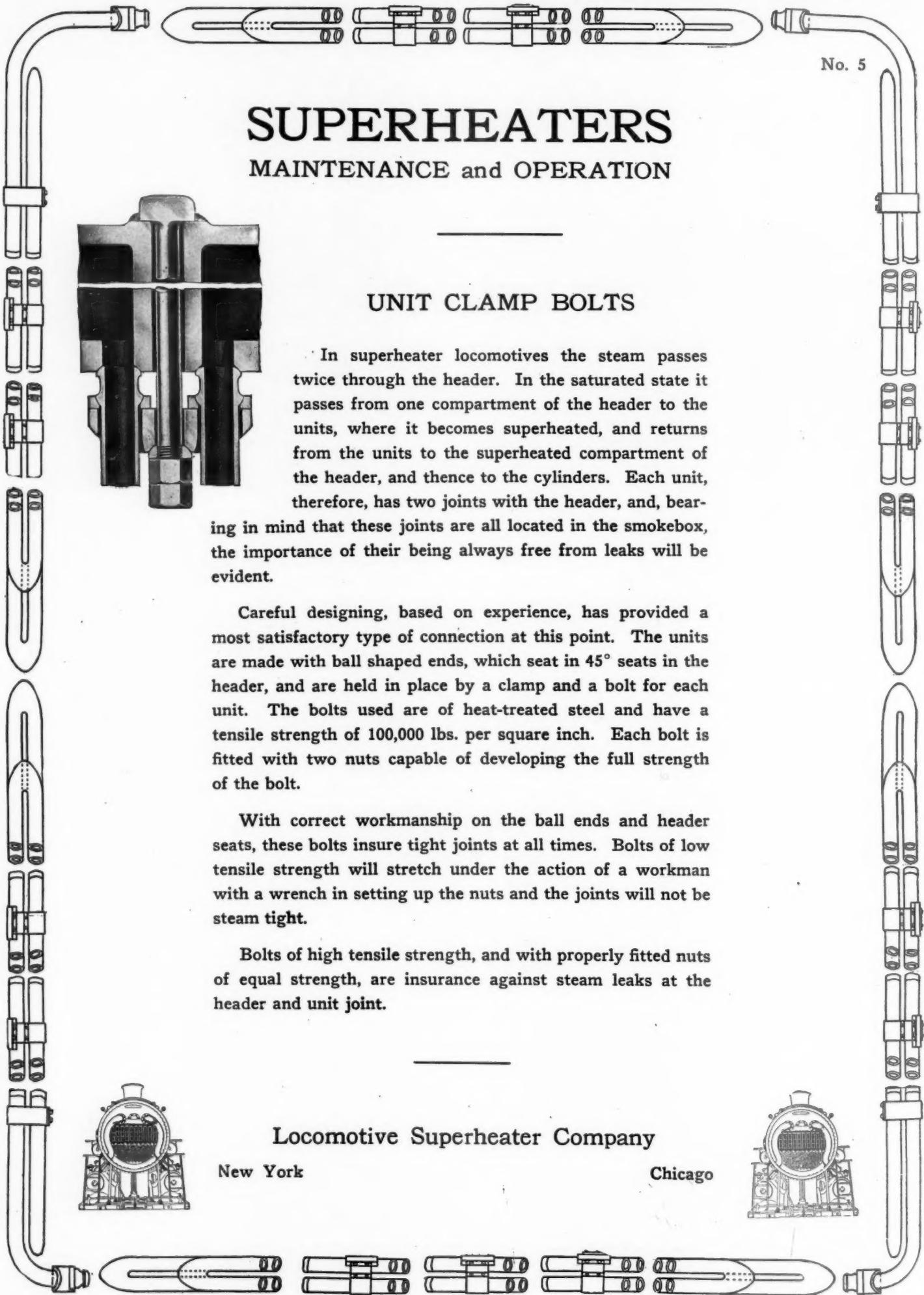
We have become a nation—a real nation.

This brings new and heavy responsibilities.

To meet them we need the most perfect
transportation in the world.

Consider the part that modernized loco-
motives can play in this development.

G. M. BASFORD CO.



SUPERHEATERS MAINTENANCE and OPERATION

UNIT CLAMP BOLTS

In superheater locomotives the steam passes twice through the header. In the saturated state it passes from one compartment of the header to the units, where it becomes superheated, and returns from the units to the superheated compartment of the header, and thence to the cylinders. Each unit, therefore, has two joints with the header, and, bearing in mind that these joints are all located in the smokebox, the importance of their being always free from leaks will be evident.

Careful designing, based on experience, has provided a most satisfactory type of connection at this point. The units are made with ball shaped ends, which seat in 45° seats in the header, and are held in place by a clamp and a bolt for each unit. The bolts used are of heat-treated steel and have a tensile strength of 100,000 lbs. per square inch. Each bolt is fitted with two nuts capable of developing the full strength of the bolt.

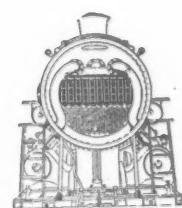
With correct workmanship on the ball ends and header seats, these bolts insure tight joints at all times. Bolts of low tensile strength will stretch under the action of a workman with a wrench in setting up the nuts and the joints will not be steam tight.

Bolts of high tensile strength, and with properly fitted nuts of equal strength, are insurance against steam leaks at the header and unit joint.

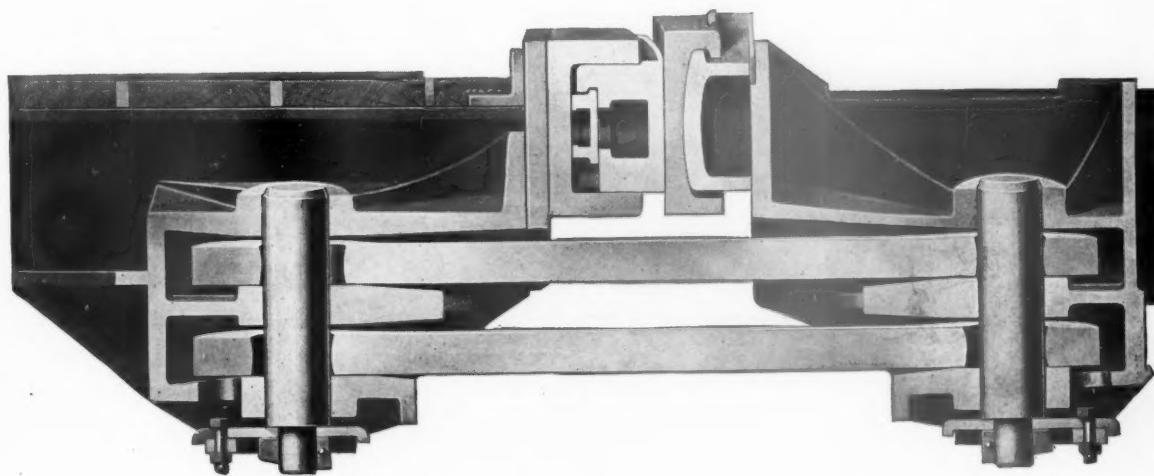
Locomotive Superheater Company

New York

Chicago



COMBINED SAFETY



With a Unit Safety Bar to protect the engine-tender connection there is no chance of dropped aprons or complete separation of engine and tender. Slack chains and slotted bars fail singly and invite trouble, but a unit bar is as strong as the drawbar and is always ready to take the load.



With Radial Buffers tight coupling bar won't lock chaffing iron This gives easier riding, reduces flange wear on tender trucks and reduces liability of derailment.

Franklin Railway Supply Company, Inc.

30 CHURCH STREET

NEW YORK

332 So. Michigan Avenue
Chicago

Franklin Railway Supply Co. of Canada, Ltd.
Montreal

LOST POWER

Every railroad realizes the importance of wise use of coal.

Nearly all have a high class organization to instruct in proper firing to prevent waste.

Yet there are 25,000 engines not yet equipped with brick arches.

And the brick arch should be the first step because no firebox is right without one.

Of course the 25,000 archless engines are the old ones.

Equip them and make a record.

AMERICAN ARCH COMPANY

Specialists in Locomotive Combustion

30 Church Street
New York

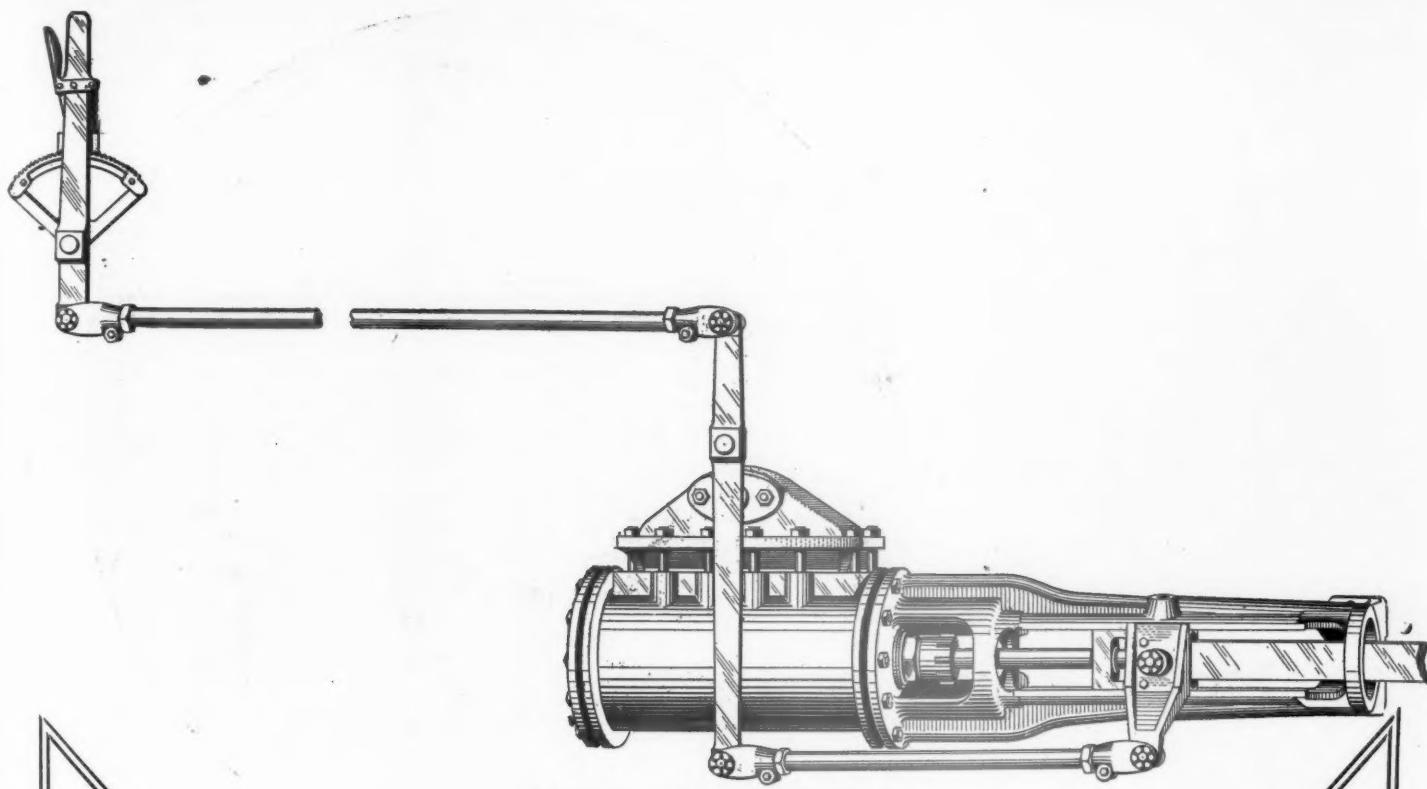
McCormick Building
Chicago



POWER SAVING ARCH



POWER SAVING ARCH



MAKE IT A RAGONNET ENGINE

ON OLD AND NEW RAGONNET HAS THE SAME EFFECT

For every four yard engines equipped with Ragonnet you gain one engine.

This is because these four engines do the work formerly done by five.

Ragonnet multiplies the power of the engine you already have.

When you get new power insist that Ragonnet be specified because you'll have quick switchers that will make your record.

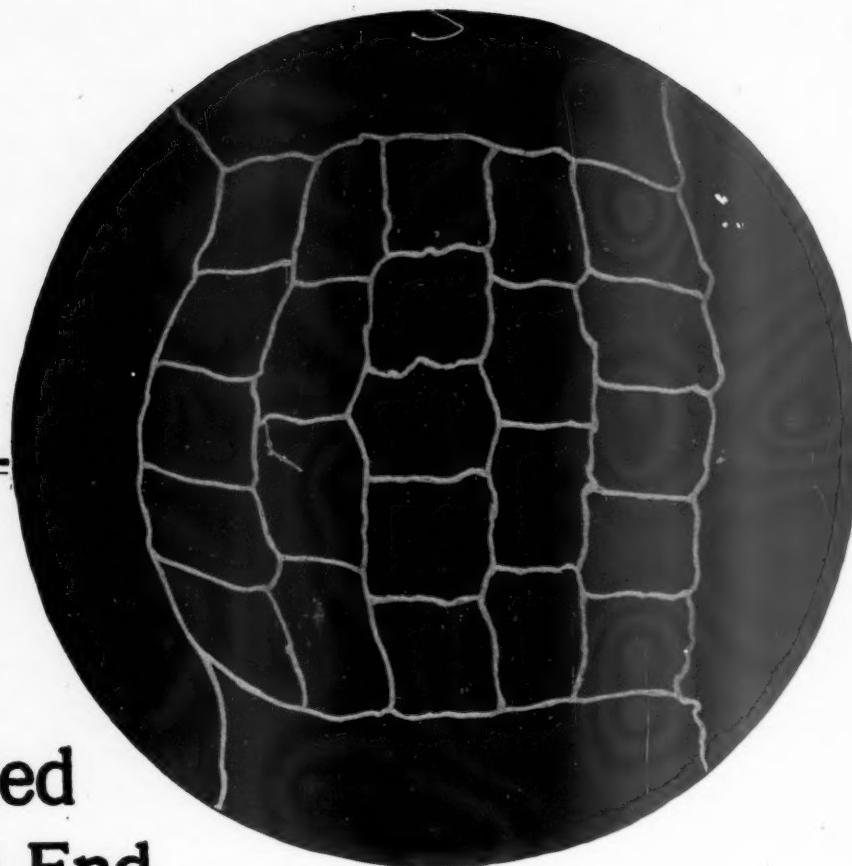
Franklin Railway Supply Company, Inc.
30 CHURCH STREET

NEW YORK

332 So. Michigan Avenue
Chicago

Export Department—International Railway Supply Co., 30 Church St., New York

Franklin Railway Supply Co. of Canada, Ltd.
Montreal



Have You Ever Studied the Etched End of Staybolt Iron?

It reveals many things.

It shows how the iron is made.

It shows how close and fine the fibres are.

Close, fine fibre indicates repeated rollings.

That's what gives flexibility to good wrought iron that can't be had in steel.

Study Rome Superior—it is box piled and twice made.

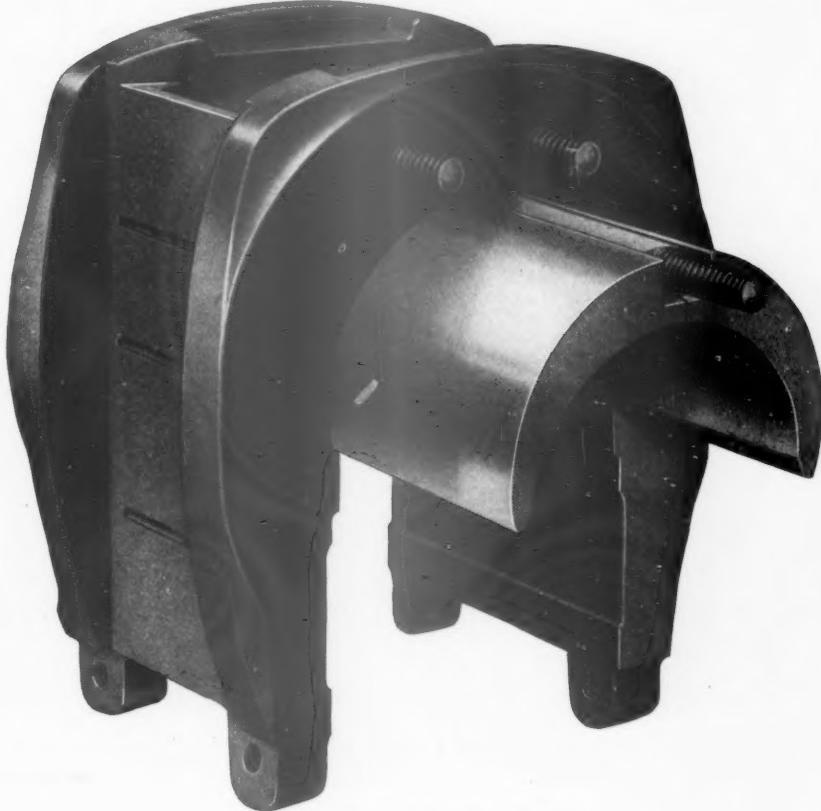
It is made to give service in locomotive boilers.
Use it with confidence.

Rome Iron Mills, Inc.
30 Church Street, New York

Works:

Rome, N. Y.

NECESSARY
FOR
CONTINU-
OUS
OPERATION



Franklin Driving Box Brass

When driving wheel loads were light and maintenance easy, split driving box brasses would have been an unnecessary refinement.

Not so today!

With the big modern engines of today brass such as the Franklin is as essential over the wheel load as the heavy rail under it.

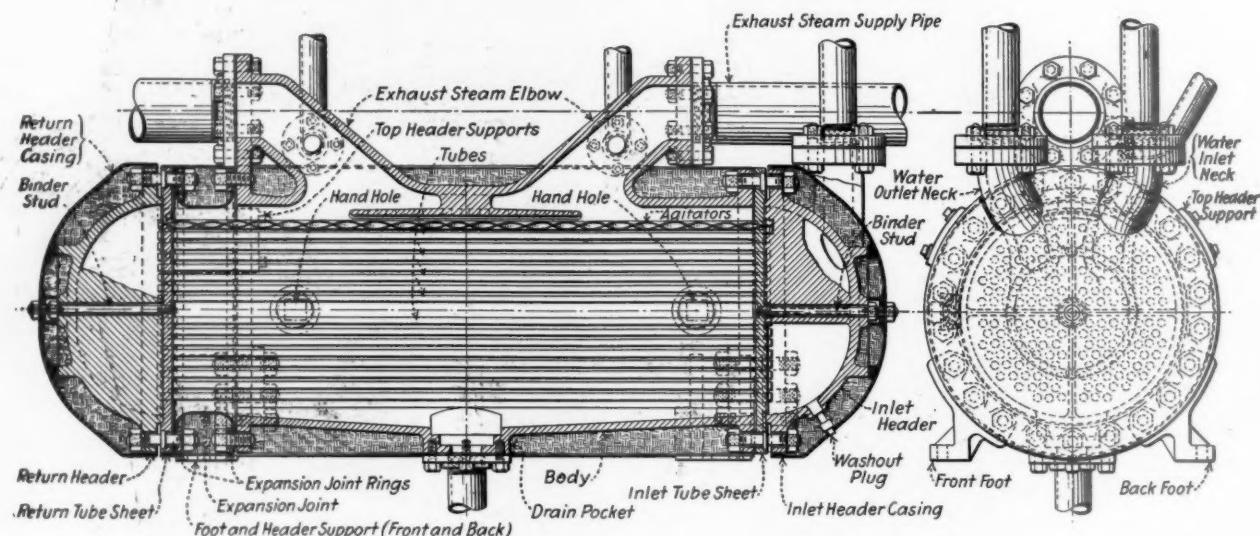
Changed conditions have made Franklin Driving Box brasses necessary to continuous operation.

Franklin Railway Supply Company, Inc.
30 CHURCH STREET NEW YORK

332 So. Michigan Avenue
Chicago

Franklin Railway Supply Co. of Canada, Ltd.
Montreal

Export Department—International Railway Supply Co., 30 Church St., New York



“PROVEN”

Every 11 degrees raise in the temperature of feed water gives an economy of 1% in coal.

It's a matter of plain arithmetic.

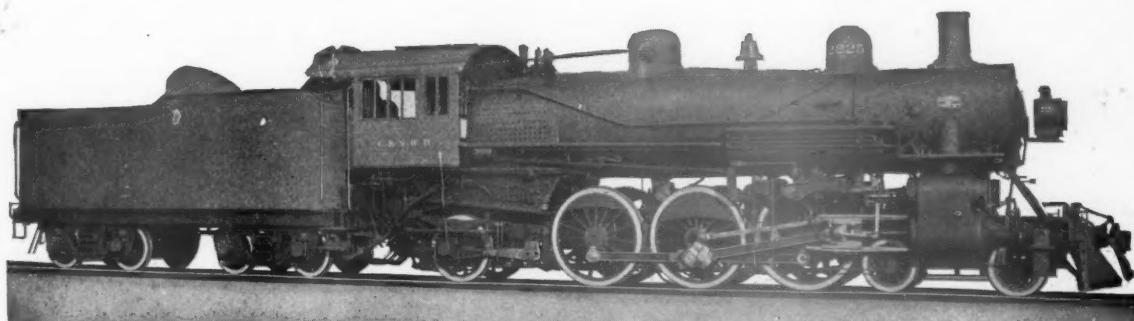
It has been demonstrated under operating conditions.

There can be no question of principle.

Feed Water Heating is only a problem of mechanical construction.

Locomotive Feed Water Heater Co.
30 Church Street New York

CHICAGO & NORTH WESTERN RAILWAY



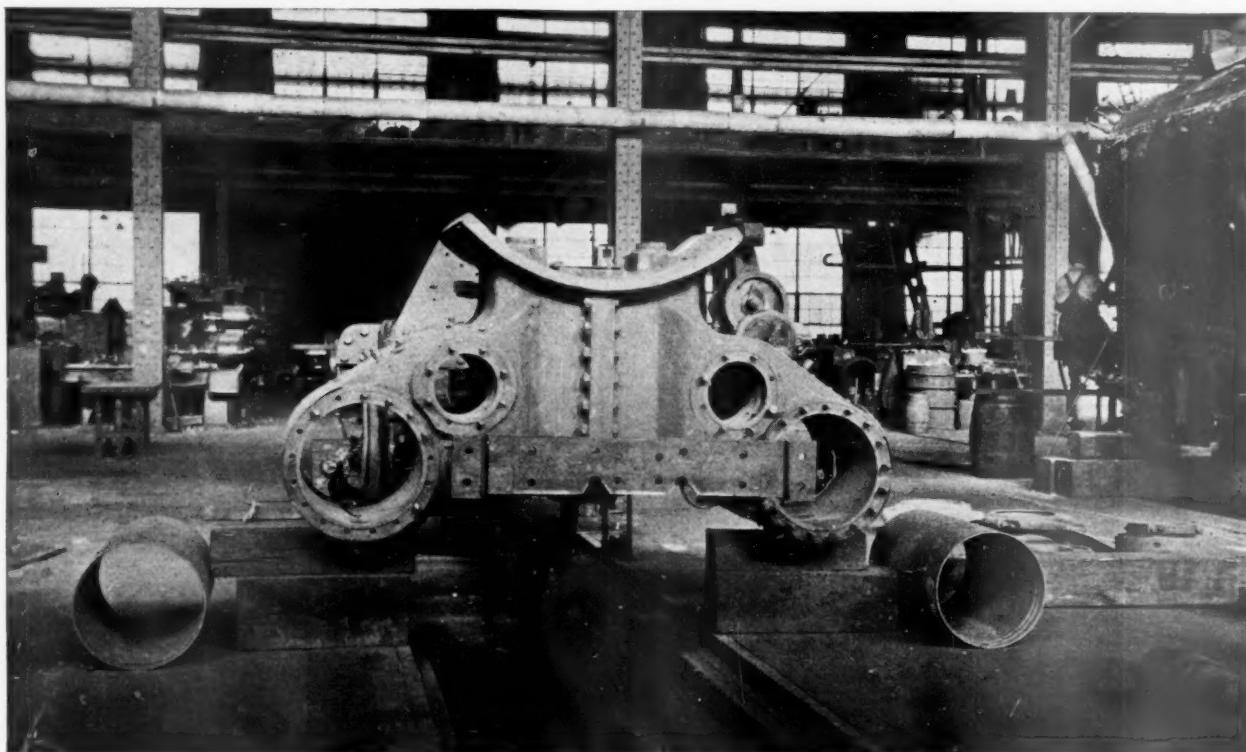
PACIFIC TYPE LOCOMOTIVE

Total Weight of Engine, 233,000 pounds; Weight on Drivers, 140,000 pounds; Diameter of Drivers, 63 inches; Boiler Pressure, 180 pounds; Cylinders, 22 x 26 inches; Maximum Tractive Power 27,900 pounds.

The Galena division, connecting Chicago, Lake Geneva and Williams Bay, a distance of 77 miles, has a ruling grade of 1.0 per cent 4 miles long.

One of these engines hauled the Williams Bay Express, composed of 10 Pullmans, over this division at an average speed of 65 miles per hour.

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK



The Business End Of Your Engine Should Have Hunt-Spiller Gun Iron Cylinder Bushings

WHERE cylinders are subjected to a high degree of superheated steam, it is essential that a material employed therein be not only of the correct chemical analysis but also of the proper physical structure. This insures the best resistance from the weakening effect of superheated steam.

The structure and quality of such a metal is dependent not only upon approximately seven per cent of impurities (silicon, manganese, sulphur, phosphorus and carbon) present in iron, but upon the character of the remaining ninety-three per cent.

Hunt-Spiller Gun Iron has not only the correct chemical analysis, but also the physical properties, a fact that is proven from results obtained in actual service.

Made Only by

HUNT-SPILLER MFG. CORPORATION
W. B. Leach Pres. & Gen. Mgr. J. G. Platt, Vice-Pres. & Sales Mgr.

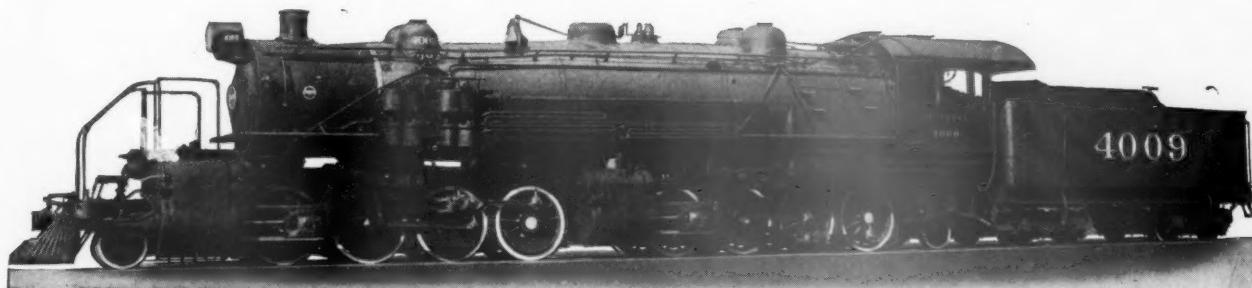
Office and Works

383 Dorchester Ave.

South Boston, Mass.

THE FIFTY-THOUSANDTH BALDWIN

**Baldwin Locomotive Number Fifty Thousand
is one of twelve Mallets built for the Southern Railway**



The Fifty Thousandth Locomotive
J. Hainen, Staff Officer (Mechanical) Southern Railway

CYLINDERS—25 & 39 x 30 inches.
DRIVING WHEELS, DIAM.—56 Inches.
STEAM PRESSURE—210 lbs.
GRATE AREA—83 sq. ft.

WATER HEATING SURFACE—4,993 sq. ft.
SUPERHEATING SURFACE—1,260 sq. ft.
WEIGHT ON DRIVING WHEELS—374,000 lbs.
WEIGHT, TOTAL ENGINE—427,000 lbs.

TRACTION FORCE—84,800 lbs.

This locomotive is in road service on the Appalachian Division, where grades are heavy and curves are sharp and frequent. It is equipped with superheater, mechanical stoker and power reverse gear.

THE BALDWIN LOCOMOTIVE WORKS PHILADELPHIA, PA.

Represented by

F. W. Weston, 120 Broadway, New York, N. Y.

C. H. Peterson, 627 Railway Exchange, Chicago,
III.

A. S. Goble, 1210 Boatmen's Bank Building, St. Louis,
Mo.

G. F. Jones, 407 Travelers Building, Richmond, Va.

A. J. Beuter, 312 Northwestern Bank Building,
Portland, Ore.

Williams, Dimond & Co., 310 Sansome Street, San
Francisco, Cal.

Cable Address: "BALDWIN, PHILADELPHIA."

Lukens

FUTURE service conditions—
stress and strain—are considered
in the making of **LUKENS** Steel.

Lukens Steel must be made right.
Its structural characteristics—texture
tensile strength, elongation, chemical
analysis—must be absolutely true to
the high Lukens ideal of Standards.

Lukens Signifies Quality

LUKENS STEEL CO.
Coatesville, **Penna.**

Put Some Pep In Your Old Power

Putting the "Pep" in your old power is a very simple and inexpensive matter compared with the results obtained.

With every application of

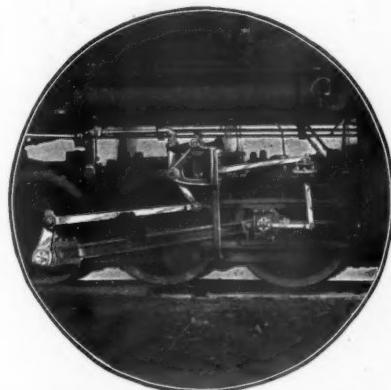
The Baker Valve Gear

you get a 5% increase in the pulling capacity of the locomotive—you save 5% in fuel consumption and 90% in valve gear maintenance over the old link gear.

Standardization of parts that are interchangeable on all types of locomotives. This means number of repair parts to be carried in stock is negligible. We can furnish what parts you require quickly and unskilled labor can apply them.

The Baker Valve Gear keeps engines out of the house and on the road. Engine failures due to valve gear troubles are practically unknown.

The Time to Apply
The Baker Valve Gear
Is NOW



THE PILLIOD COMPANY

30 Church Street, New York, N. Y.

BAKER VALVE GEAR
Over 5,000 in Service

Western Representative—Mudge & Co., Railway Exchange, Chicago, Ill.

**"In Two
Parts
Only"**

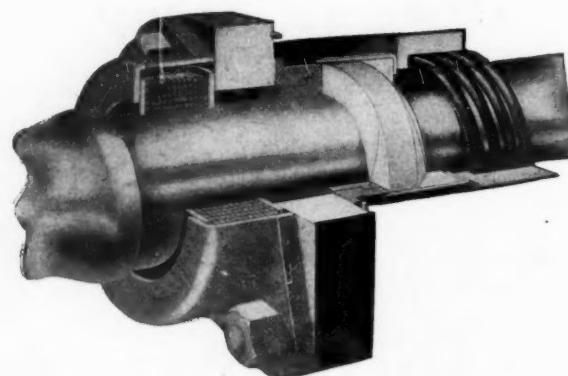


One of the first considerations in selecting a packing is—Will it fully meet the test of hard—continuous wear? Is it simple and rugged enough to withstand severe service? Has it high heat resistance and is it maintained easily and at low cost? Note—

O KING O METALLIC PACKING

So simple anyone can apply it—King is strong enough to endure the most severe service. The highest superheated temperature cannot affect the composition.

For piston rods—valve stems and air pump piston rods, King insures steam-tight service under all conditions.



**The United States Metallic Packing Co.
Philadelphia, Pa.**

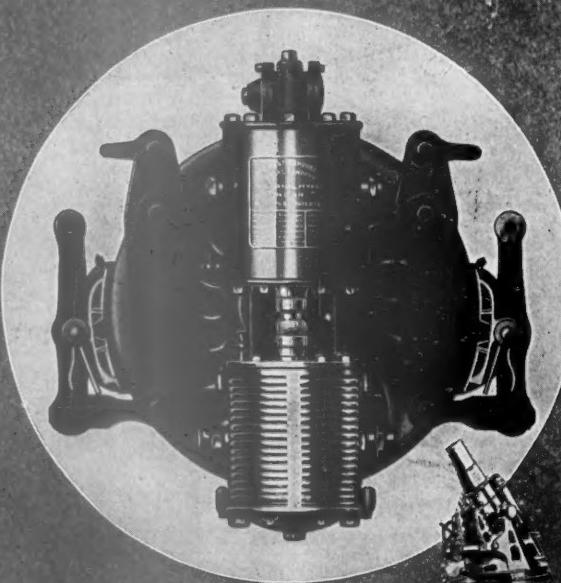


Small Increments—Huge Aggregate



The throbbing sound one hears from the locomotive upon alighting from the train at his destination, reminding him of the panting of the thoroughbred at the race's finish, is produced by the air compressor ramming up numerous small increments of pressure for the air brake. These small increments bulk large in the aggregate; in fact, they constitute a powerful force which will bring a modern passenger train to a standstill in 1000 feet from a speed of 60 miles per hour. This same force, if exerted by a modern gun, would hurl a 1000 lb. shell a distance of 24 miles.

If the entire sum of Two Billion Dollars comprehended in the Government War Savings Stamps plan consisted entirely of 25-cent coins, and these coins were laid in an East and West straight line, touching each other, the line would reach nearly 5 times around the earth's surface at the equator. Thus there would be formed 5 silver bands encircling the earth, running over 120,000 miles of valley, plain, mountain and sea. Five years hence, Uncle Sam will unwind these silver bands, break them up, and redistribute the coins with interest to patriotic purchasers of War Savings Stamps.



Brake Building Our Business for a Lifetime

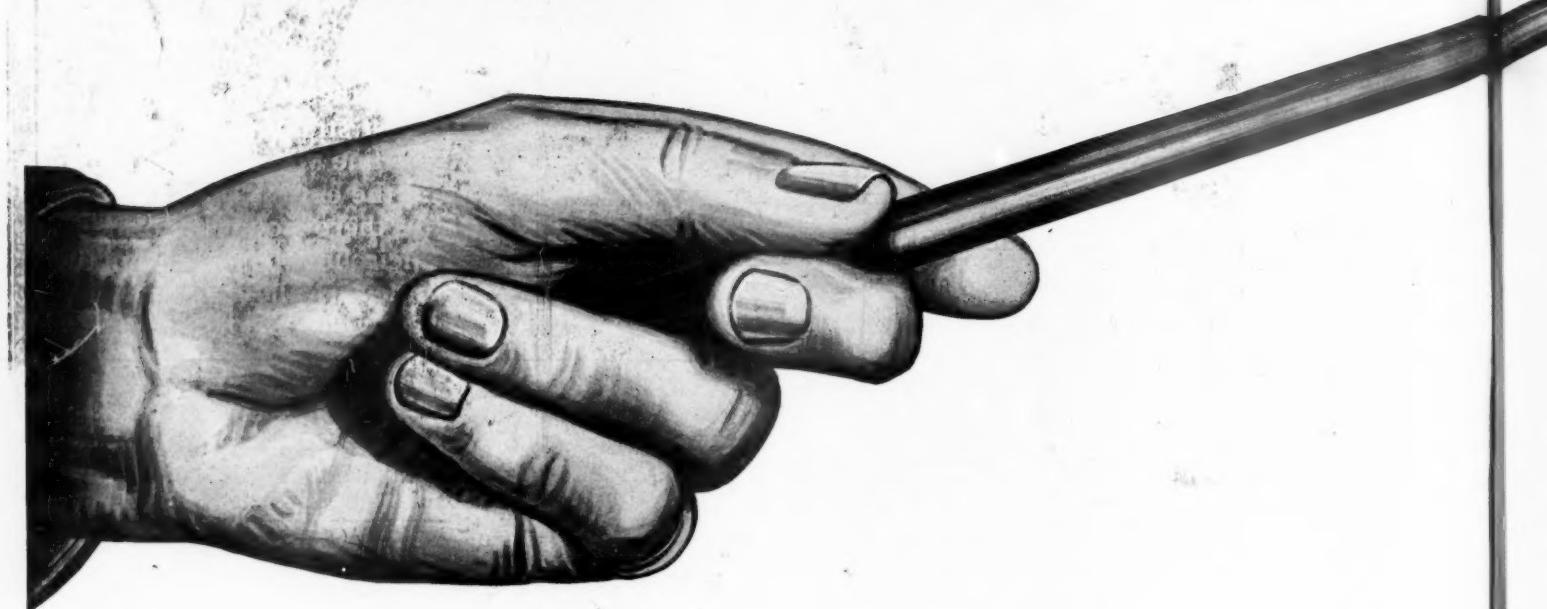
Westinghouse Air Brake Co.

Pittsburgh, Penn'a.



Pertinent Points

On Progressive Practice



POINT TEN

Factors and Facts

A JOURNAL Box Wedge is a small thing—true, yet remember the daily total of unnecessary time expended in the removal of wedges is no small thing, no small factor in delay of train operation.

SPEED, SAFETY and SAVING

those big factors in the operation of the G. A. R. S.—Great American Railway System, are assured facts in the

M. C. B. Standard Journal Bearing Wedge

WESTERN RAILWAY EQUIPMENT COMPANY
St. Louis Missouri

Here You Are Gentlemen



Most Easily Removable Wedge on the Market

M. C. B. Standard Type

JOURNAL BEARING WEDGE

Made of Highest Grade Malleable Iron perfectly distributed to give lightness and strength. Study the illustration, this point on the wedge that

Saves Time and Expense

is worthy of careful consideration, just the wedge itself is worthy of your confidence.

Attention!

Users of Glazier Headlights

**WHY WASTE DOLLARS,
Purchasing New Cases and
Reflectors When Old Ones
Will Do?**

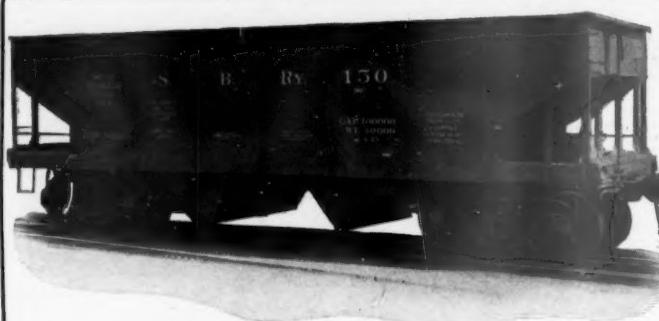
**CONSERVE LABOR and MA-
TERIAL by Converting Oil
Headlights for Electricity at
Small Cost.**

Let Us Tell You How

**The Glazier Manufacturing Co.
Rochester, N. Y.**

Oscar F. Ostby, Mgr. of Sales
1044 Grand Central Terminal, New York, N. Y.
Western Representative
J. H. Sharp, Railway Exchange Bldg., Chicago, Ill.

2



PROTECTION FOR STEEL CARS

The best and longest protection possible is given steel cars when painted with

DIXON'S SILICA GRAPHITE PAINT

It "lasts longer" and is the most economical in labor and material per year of service.

It has been made in First Quality only for over fifty years. Recommended and used for all metal and wood protection. Write for Booklet No. 105-B.

Made in Jersey City, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY



Established 1827



F. RICHARDSON PRES & TREAS

ESTABLISHED 1865

W. J. MILLER SECRETARY

PITTSBURGH FORGE & IRON CO. PITTSBURGH, PA.

MANUFACTURERS
OF

CAR

HEAT TREATED ATLAS TOUGHENED
CRANK PINS AXLES PISTON RODS

LOCOMOTIVE

— MERCHANT REFINED IRON —

ATLAS STAY BOLT AND ENGINE BOLT IRON

THOR IRON FORGING BLOOMS,

SCREW SPIKES — HEAVY FORGINGS — TRACK BOLTS —
ARCH BARS, FOLLOWER PLATES, TIE PLATES.

CHICAGO OFFICE RAILWAY EXCHANGE BLDG.



There are not many Railroads in the United States but what have had some experience with the Tate Flexible Staybolt as applied to Locomotive Boilers.

A major portion of the railroads, however, have had sufficient experience with the use of the Tate Bolt, under all conditions of firebox service, to enable them to judge its true value in determining its merits from the standpoint of practical utility and economy, in firebox service.

The increased use of the Tate Flexible Staybolt among all patrons who have followed its service carefully, is sufficient indication to prove that the results obtained have fully justified its greater use and application to all fireboxes for high pressure duty.

Rigidly connected fireboxes belong to the practices of the past, and the laws of expansion that hold to the fact that suitable provisions must be made to compensate for the movement of all heat absorbing plates, is strongly adhered to in present day practice, and is followed by those who are aware of the futility of the rigid stay to obtain results that are the most desirable in this direction.

The Tate Flexible Staybolt allows the firebox to expand with more freedom and under less restriction than when rigidly stayed, thus contributing to the longer service life of all materials involved, and enhancing the value of the locomotive boiler as an earning factor.

IN USE ON OVER 650 RAILROADS

FLANNERY BOLT COMPANY

VANADIUM BUILDING, PITTSBURGH, PA. B. E. D. STAFFORD, V.-Pres. and Gen. Mgr.

J. ROGERS FLANNERY & COMPANY, Selling Agents
Vanadium Building, Pittsburgh, Pa.

GEO. E. HOWARD
Eastern Representative

W. M. WILSON
Western Representative

COMMONWEALTH SUPPLY CO.
Southeastern Representatives

CHAS. HYLAND
Boiler Expert

Special Oils

For Special Purposes

Galena-Signal Oil Co.
Franklin, Pennsylvania

Dearborn Service

IS just as important an aid to economical railway operation in this time of reconstruction as during the most strenuous months of the war period.

The railways must use the best in every line of supplies, in order to maintain the standard of service required. Dearborn Water Treatment has proven its value and is now in use on more than 100 railways in the United States. A satisfied user is the best recommendation of the quality of the product.

Our organization of chemists and mechanical experts is at the service of the railways at all times in the solving of bad water problems.

Dearborn Chemical Co.
332 S. Michigan Avenue, Chicago

CONSERVE LABOR

EVERYONE possesses some degree of energy. That energy expressed, is *labor*. Without *labor*, the world would suddenly stand still. Production of any kind would be absolutely impossible. Humanity would perish.

Labor is, and will continue to be scarce. *Labor* is costly. Expenditure of labor through inefficient methods is a waste not only of *labor* but of time and money, all of which should be expended more profitably.

BOWSER

Systems

for the storing and handling of oil and gasoline will conserve 70% of the labor necessarily expended by less efficient methods. They also conserve:-

Time	Capital	Space	Machinery
Lives	Property		Material

Bowser Systems

Are:

Leakproof Lossproof Fireproof
Dirtproof Evaporation proof
Deterioration proof.

An inquiry carries no obligation whatever.
Let us help you CONSERVE LABOR.
A System for every Requirement.

S. F. BOWSER & COMPANY, Inc.
P. Wayne, Indiana, U. S. A.
Sales Offices in all Centers. Representatives Everywhere.



H. H. HEWITT
President

W. H. CROFT
First Vice-President

MAGNUS COMPANY (INCORPORATED)

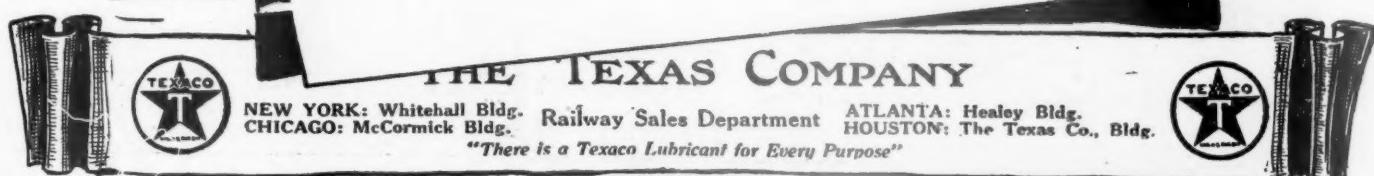
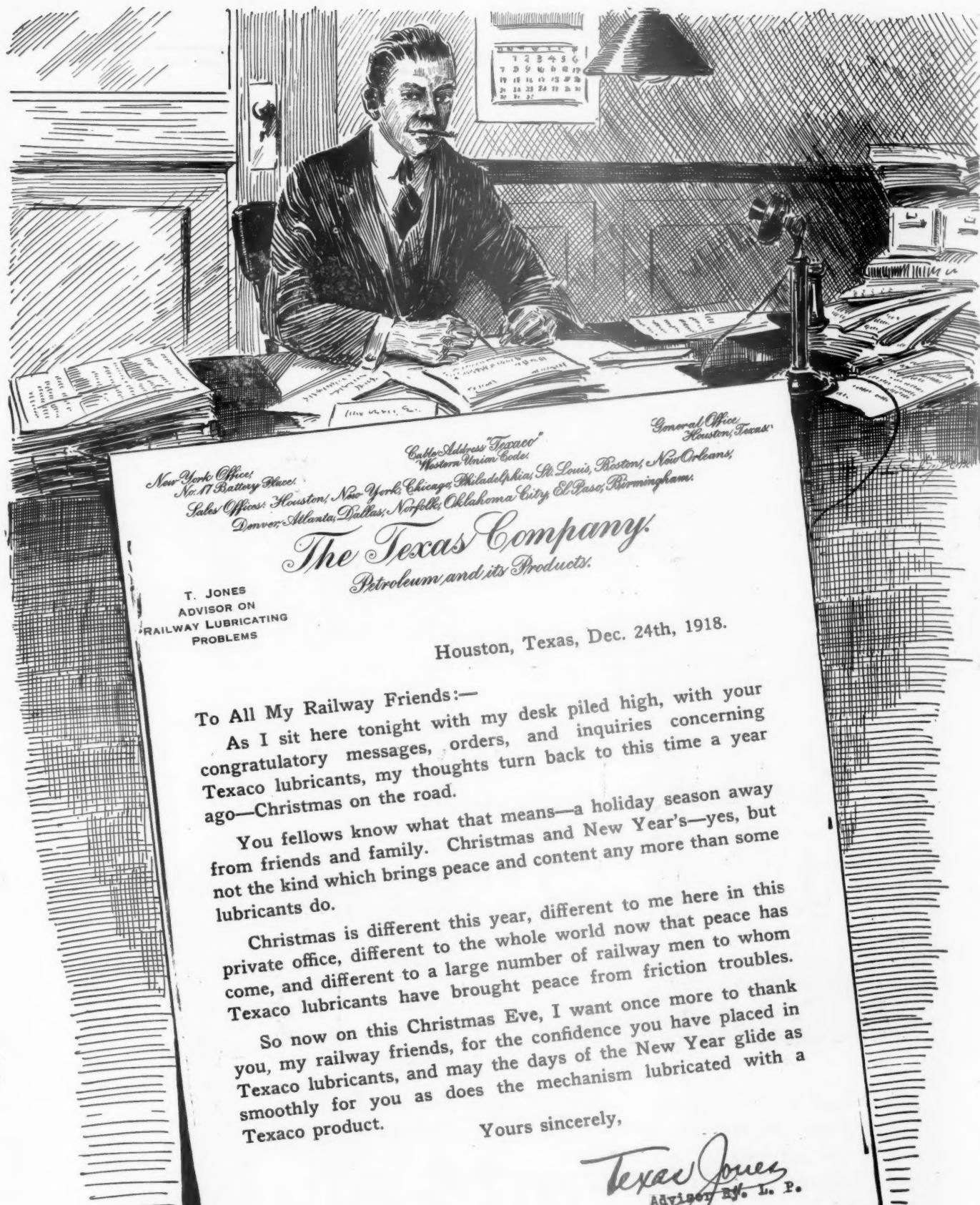
Journal Bearings

AND

Brass Engine Castings

New York

Chicago



FUEL SAVING

International Water Softeners insure energy from every pound of coal burned. Watch for details in large ads in following issues.

INTERNATIONAL FILTER CO., INC.
Water Softening and Filtration Plants
Chicago New York

Permutit
COMPANY'S
Lime Soda
Water Softener
Kennicott System
The Permutit Company, 440 Fourth Avenue, New York, N. Y.

A proved apparatus for the prevention of boiler scale and its resultant losses and delays in locomotive operation. Send for the Bulletins.

Ashton High Grade Pop Valves—Steam Gages
the quality standard for over 40 years
Exclusive features insuring greatest efficiency and durability

THE ASHTON VALVE CO.
Boston and Chicago

PORTER LOCOMOTIVES

Steam—Fireless—Compressed Air
Without cost to you let our experienced engineers serve you in selecting the best haulage system as adapted to your particular needs.

H. K. PORTER CO.
1214 Union Bldg., Pittsburgh, Pa.

5

THE EDNA LIFTING INJECTOR TYPE "O"

This type of Injector is considered to be one of the best automatic lifting injectors that we manufacture. The cost of maintenance of these injectors is very low as all parts are carefully designed and cast out of special metals to stand wear and hard usage. The tubes are cast out of a special formula of bronze which insures long service. Built in sizes from No. 1 to 12.

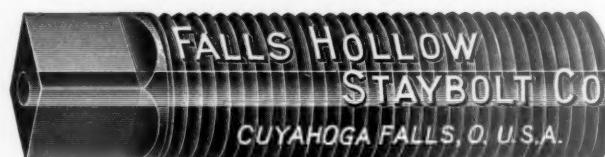
Guaranteed to work equally well at 40 to 250 lbs., steam pressure. Convince yourself by ordering one on 60 days' trial.

We manufacture a complete line of Injectors, Lubricators, Boiler and Line Check Valves, Reflex Water Gauges and other brass locomotive appliances.

Descriptive lists and prices on application.

THE EDNA BRASS MFG. CO., Cincinnati, O.
Chicago Office: 551 McCormick Building

HOLLOW THREADED STAYS



Fully comply with Federal Inspection Law, save the cost of drilling and breakage of drills. The hole is rolled absolutely in the center. They inspect automatically at both ends and the air admitted into the firebox through Hollow Stays greatly improves combustion.

QUALITY AND WORKMANSHIP GUARANTEED
Write us for prices

FALLS HOLLOW STAYBOLT COMPANY
CUYAHOGA FALLS, OHIO

2

BRAKE SHOES



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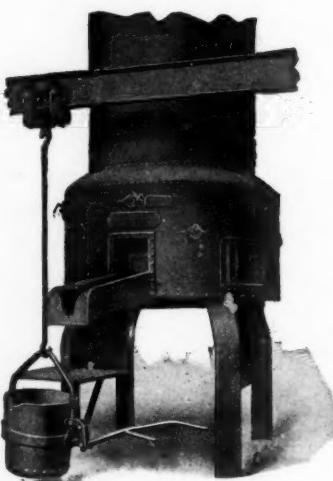
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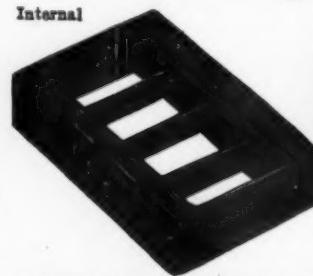
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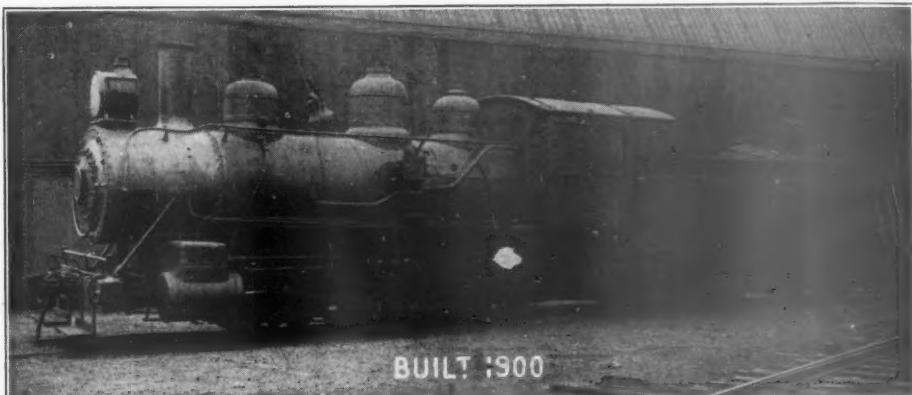
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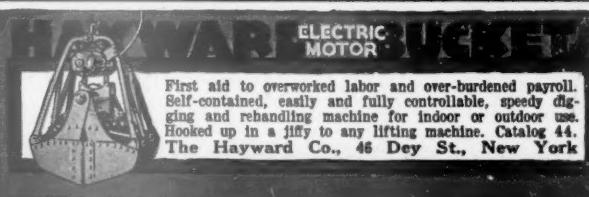
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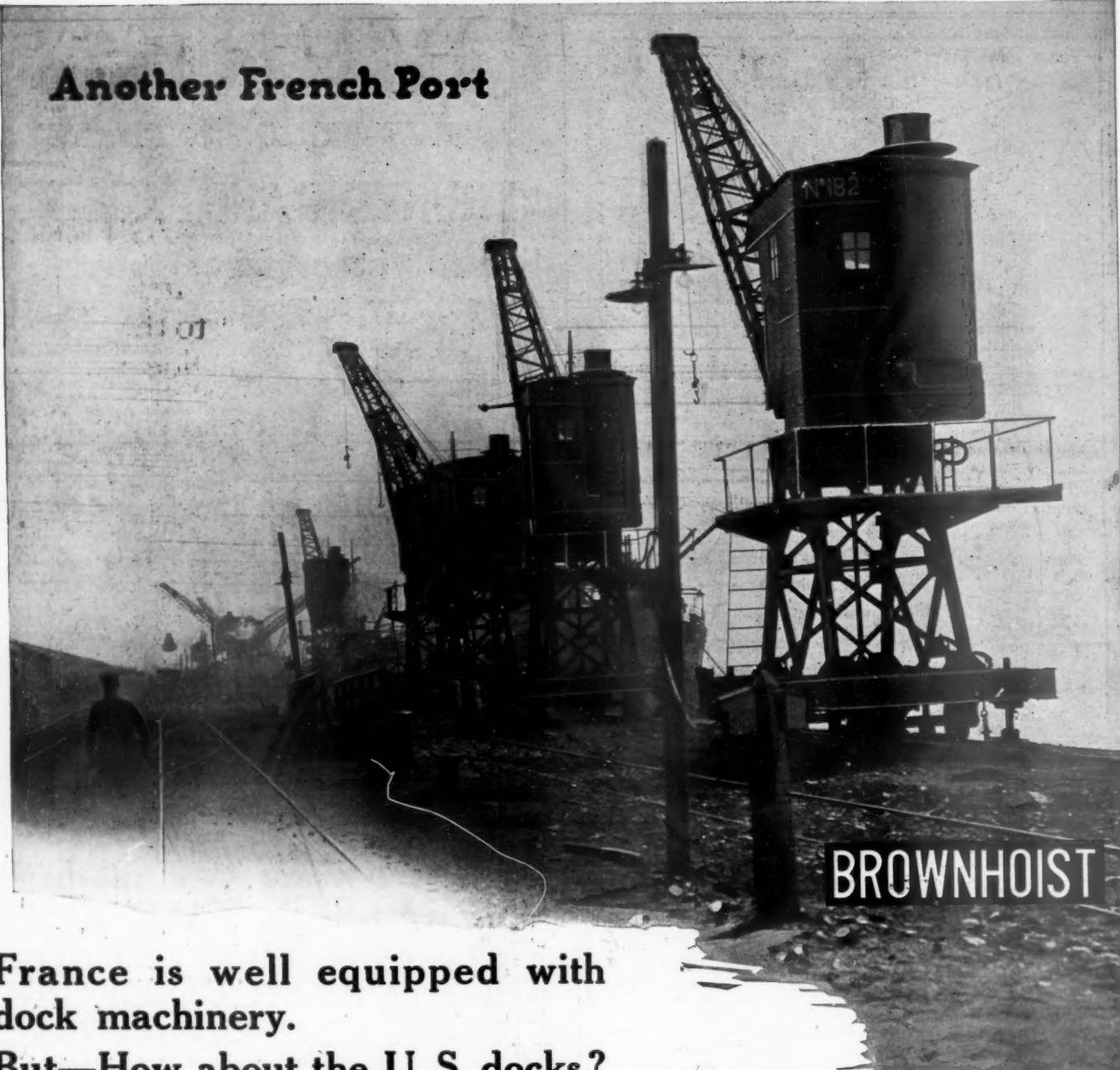
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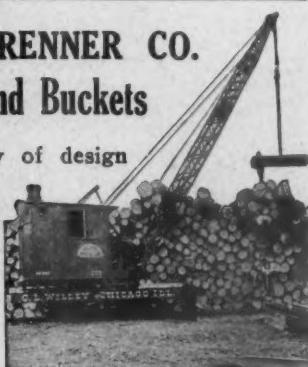
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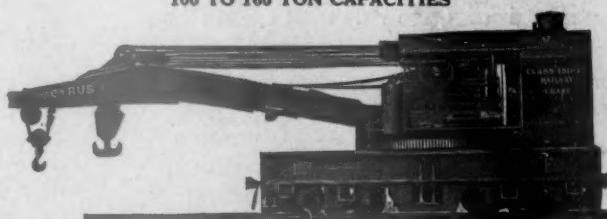
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3



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By Samuel O. Dunn
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